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# IMPERIAL BUREAU OF FRUIT PRODUCTION

## HORTICULTURAL ABSTRACTS

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<i>Assistant</i> .. . . .	G. ST. CLAIR FEILDEN, B.A.
<i>Secretary</i> .. . . .	MISS R. M. ALLISTON.



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## VOLUME III

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## HORTICULTURAL ABSTRACTS.

Vol. III.

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No. 1.

**Abstracts.** Initialled abstracts in the present number are by T. N. Hoblyn, R. C. Knight and W. S. Rogers, the remainder being by the Bureau Staff.

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## Horticultural Abstracts

Vol. III

March, 1933

No. 1

## HORTICULTURE—MISCELLANEOUS.

1. TINKER, M. A. H., AND DARBYSHIRE, F. V. 631.811.3 : 581.035 : 581.144.2  
**Studies on the formation of tubers and other storage organs. The influence upon translocation of the period of light and the supply of potassium.**  
*Ann. Bot.*, 1933, 47 : 27-53, bibl. 37.

This is an account of experiments carried out at Wisley on the influence of the daily period of light and the supply of available potassium on the rate of accumulation of carbohydrates in the storage organs of *Phaseolus multiflorus*, *Dahlia* (2 vars.) and *Stachys tuberifera*. The influence of potassium was determined by growing the plants from seed, cuttings or small pieces of tuber of known K content in sand to which were added known quantities of culture solution containing or deficient in K. Na was also used to replace K. Generally the absence of K did not cause such pronounced differences in habit of growth as did the various light treatments. The effects observed are noted. It was noticeable that in all plants K accumulated gradually in the tubers, moving in plants deprived of this element against the gradient, in other plants with the gradient of the concentration. The authors consider that the evidence as a whole indicates that K deficiency may diminish carbohydrate assimilation, protein synthesis and the production of dry matter, and that light, regulating the general growth, appears also to exercise an influence upon the rate of uptake of potassium.

2. WEST, E. S. 631.436 : 631.51  
**The effect of a soil mulch on soil temperature.**  
*J. Council Sci. Ind. Res. (Australia)*, 1932, 5 : 236-46.

In this experiment the temperatures in a bare undisturbed soil are compared with those in a cultivated soil having a loose surface layer. It is deduced that the heat diffusivity of the cultivated soil was reduced to 0.17 of that of the compact uncultivated soil. As a result the soil temperature wave of cultivated soil is markedly "damped" when compared with that of the uncultivated soil for any particular depth below the cultivated layer.

3. NEILSON, J. A. 631.536  
**Some recent information on reducing storage and transplanting losses in trees and shrubs.**  
*Proc. 8th National Shade Trees Conf.*, University of Rochester, N.Y., 1932, pp. 103-11.

The method advocated is dipping the plants into melted paraffin wax at a temperature of 180°-190°F. The wax should not come in contact with the roots and the plant must be withdrawn immediately. Large coniferous and deciduous trees are now being experimentally sprayed

with liquid wax before transplanting, so far with success. The cost of spraying material for large oaks 40 ft. high was one dollar. It is claimed that this method prevents desiccation, prevents mould on roses and reduces summer sunscald in newly planted trees.

## 4. HAWKER, LILIAN E.

581.144.2

**Experiments on the perception of gravity by roots.***New Phytol.*, 1932, **31** : 321-8, bibl. 11.

The author summarizes the results of her work as follows :—

1. It is shown that a greater positive curvature can be induced in an unstimulated root of *Vicia Faba* by hormones extracted from the *lower* halves of geotropically stimulated root tips than by hormones extracted from the *upper* halves of the same root tips, indicating that the growth hormones accumulate in the lower half of the tip of a geotropically stimulated root.

2. It is shown that with opposite gravitational stimulation of growing region and tip in roots, the tip has a stronger directional influence on the curvature than has the growing region.

3. Geotropic presentation time [i.e. the time taken for curvature to begin following geotropic stimulation.—ED.] appears to correspond to time taken by redistribution between upper and lower halves rather than conduction of hormones [i.e. the redistribution of sufficient growth hormones in the tip to cause curvature of the growing region, while the conduction of the stimulus backwards from the tip does not take place till later.—ED.]. The following will be sufficient to explain the technique employed. Roots of seedlings of *Vicia Faba* were decapitated when the roots were 6-12 cm. in length. Previous to the removal of the tips two-thirds of the number were geotropically stimulated by being maintained in a horizontal position in a dark damp chamber for 3 hours, the remaining third being placed vertically in the chamber. At the end of this period the stimulated tips were cut off and bisected longitudinally so as to divide the portion which had been uppermost from that which had been underneath. These divided tips were then stuck on small blocks of 10% gelatine for the purpose of extracting the growth hormones, a method already proved successful by various workers. The root tips were after 1 hour removed from the gelatine which was then stuck eccentrically by means of a drop of warm gelatine on the decapitated stumps of the non-stimulated (vertical) roots. Half the blocks thus contained hormones from the upper halves of the stimulated tips and half from the lower. Precautions were taken to prevent wilting. In the result the response curvature was always towards the block of gelatine but markedly greater in the case of the blocks containing hormones from the lower halves.

## 5. FORESTRY COMMISSION.

634.94 : 581.144.2

**Studies on tree roots.***Forestry Commission bull.* **13** : 1932, pp. 73, bibl. 48.

An account of investigations on the roots of young trees carried out over a series of years for the Forestry Commission by Dr. E. V. Laing. Special attention is paid to mycorrhiza and to the development and action of roots in peat soils.

## 6. COSTER, CH.

581.144.2 : 635.952.2

**Wortelstudien in de tropen (Root studies in the tropics) Part I.***Landbouwe*, 1932, **8** : 146-94, bibl. 34 ; also "*Tectona*," 1932, **25** : 828-72, and*Korte Med. v.h. Boschbouweproefstation*, **29**.

Parts II and III.

*Landbouwe*, 1932, **8** : 369-464, bibl. 61, also *Korte Med. v.h. Boschbouweproefsta.* **31**.

To attempt to compress the mass of information contained in these articles within the limits of an abstract would be scarcely satisfactory. Part I opens with a discussion of roots and their functions and then proceeds to give in tabular form a note of the root systems and early root development of 70 varieties of tropical trees and cover crops. In Part II is reviewed the present



state of our knowledge of root growth. The mature root systems of 17 trees and cover crops are discussed in detail, and there is a note on the root systems of seedlings and cuttings. Part III is concerned with the oxygen requirements of the root system. Part IV, which is still to appear, deals with root competition. The paper is well illustrated with diagrams and photographs, mainly of root systems.

7. WEIR, W.

631.459

**Soil erosion in California\* : its prevention and control.**

*Univ. Calif. Coll. Agr., Agr. Exp. Sta. bull.* 538, 1932, pp. 45.

This most useful bulletin, profusely illustrated, deals thoroughly with the various phenomena of erosion and how they can best be combated. Prevention and control may be accomplished by the following devices. *Tillage*. This includes contour cultivation, i.e. cultivation across the slope and not up and down it, of annuals. Details are given of the technique and of precautions for removal of excess water, etc. *Strip cropping* which consists of planting strips of densely growing or fibrous rooted crops between strips or rows of clean cultivated crops is also recommended. Notes are further given on the partial solution of the problem presented by the advisability of contour cultivation of established hill orchards. In this connection the author considers that the best type of erosion protection for a square or triangular-planted hillside orchard is a dense cover crop, planted early and not ploughed in until after the heavy rains are over. *Tile underdrainage*. This has been effectively used in soils with pervious, easily penetrated surfaces underlain at a few feet by impervious subsoils. Tile drains are often used in connection with terracing. *Terraces*. Terracing offers the best type of erosion protection yet devised on cultivated land. Terraces are of two types. The "bench" or "true" terrace is best adapted to steep slopes and produces a field resembling a series of stairs. The ridge terrace has a wider field of adaptation and may be recommended for more gently sloping hillsides. The ridge terrace may be of the broad base or narrow base type and either of these may again be a level or sloping terrace. The broad base, level terrace is considered the best of all terraces and is easily constructed, but is less suitable for areas of heavy rainfall than the broad base, sloping terrace, the latter also being known as the Manguum terrace. Details are given of how to construct the various terraces to suit different circumstances, of the cultivation of the terraces, of the arrangements for water outlets, etc. *Soil saving dams* are also discussed, illustrated accounts being given of pole dams, of different types of concrete dams, etc.

**TREE FRUITS, DECIDUOUS.**

*Varieties.*

8. KEMMER, E.

634.11(43)

Welche Apfelsorte halten Sie im Hinblick auf Empfehlung, Verbreitung u. Marktwert für die wichtigste Deutschlands? (**Germany's most popular apple.**)

*Obst. u. Gemüsebau*, 1932, 78 : 120.

A questionnaire to which replies were received from some 138 experts throughout the country establishes the quite remarkable ascendancy of Belle de Boskoop in popular favour. In no less than 83 replies it was given first place, against 15 replies favourable to Ontario and 9 each to Winter Goldparmäne, and Landsberger Reinette. Eight other varieties get placed first by one but never more than six judges.

\* For soil erosion in the tropics see Ceylon, *Sessional Paper III*, 1931, being Report of the Committee on Soil Erosion, Govt. Record Office, Colombo, price Rupees 1.10.



## Propagation.\*

9. FREISE, F. W. 634.3-1.521.1  
 Ueber Beziehungen zwischen verschiedenen Eigenschaften von Obstbaum-  
 samen und dem Alter der Stammpflanzen. Beobachtungen aus dem  
 brasilianischen Obstbau. (**The relationship between seed characteristics of  
 fruit tree seeds and the age of the tree. Observations from Brazil.**)  
*Gartenbauwissenschaft*, 1932, 7: 196-201.

Most of the author's observations, which were made over a period of 15 years, concerned the seed of the following oranges: Washington Navel, Laranja Selecta and Tangerina, of which he says many thousands of trees were available, though it is not stated how many trees of each sort and how many seeds were examined in each case. The rootstocks were *Citrus Aurantium* and *Citrus hystrix*. The trees were bushes, 6 m. between rows and 4-50 m. between trees. Best local cultivation methods were used. The seeds were tested for composition, germination capacity, germination energy, and for certain other characters from their 4th to their 15th year. The author concludes from his observations that the different oranges examined produce seed of the highest value, judged by the characteristics above mentioned, only for a short period of about 5 years beginning about their 8th year, after which the seeds deteriorate in the characters mentioned above. He also gives incomplete figures, which indicate the existence of a similar tendency, for the following fruits grown in Brazil: *Achras Zapota*, *Annona squamosa*, *Garcinia Mangostana*, *Mangifera indica*, *Persea gratissima*, *Psidium Guajava* var. *pomiferum*, *Spondias mangifera*.

## Rootstocks.

10. SCHINDLER, O. 634.1/2-1.541.11  
 Obstunterlagen. (**Rootstocks for fruit trees.**)  
*Special number of Obst. u. Gemüsebau*, 1932, pp. 18, bibl. 30.

This article sums up the position reached in the solution of the rootstock problem in Germany. The writer discusses the whole question of rootstock influence and shows how a proper choice of rootstock can make all the difference between success and failure in fruit growing. He then deals with the rootstocks available in Germany, and in doing so points out the particular characteristics such as burr knots which may be observed on certain easily rooting apple stocks. He does not neglect the possibility of propagating from cuttings, though he notes the scant success achieved hitherto with many desirable rootstocks. Incidentally he reports that small scale experiments on the rooting of cuttings undertaken by Wetzell and himself with different culture solutions and soil reactions gave the best results when a complete culture solution rich in nitrogen was used, the reaction being practically neutral. Other methods of inducing root formation, including some like the wiring method advocated by Höstermann and actually a revival of a method at least 100 years old, and stooling and layering are all discussed. He considers in detail the rootstocks for the different pome and stone fruits which have proved most successful at Pillnitz. He has little definite to say of cherry rootstocks. For plums most of the sorts used in England seem to appear on the German list, as well as Marunke, which is specially recommended for peaches. It is noted, however, as needing careful clonal selection, being at present very mixed. The position as regards pears is unsatisfactory and it is noted that the free pear stocks imported from East Malling have shown very poor rooting at Pillnitz. For apples four rootstocks, Pillnitz Paradise No. 7, as a dwarfing stock, Pillnitz Doucin 15 and 16 as medium vigour stocks, and Pillnitz Standard Apple Stock R.O. as a vigorous stock, are all favourably mentioned. As regards quince stocks Pillnitz Nos. 1, 3 and 5, are favourably mentioned.

\* See also 44, 75.

11. HAFEKOST, G. 631.541.11 : 634.11 + 634.14  
Über die Beziehungen zwischen Edelreis u. Unterlage bei einigen Obstarten.  
(The relations between scion and stock in certain fruit varieties.) [English summary.]  
*Gartenbauwissenschaft*, 1933, 7 : 382-95, bibl. 7.

This report is based on 5 weeks' work at the East Malling Research Station, during which time certain observations, which are here detailed, were made on wilting and desiccation in apple and quince stocks. Far reaching conclusions are drawn as to the possibility of classifying stocks for practical purposes by such physiological methods.

12. HEIMANN, D. O. R. 634.23-1.541.11  
Zur Frage der Selektion der Steinwechsel, *Prunus Mahaleb*, als Veredelungsunterlage für Kirschen. (The selection of *P. Mahaleb* as a rootstock for cherries.)  
*Obst. u. Gemüsebau*, 1932, 78 : 138-41.

The author and professor Roemer of Halle selected 14 different types of Mahaleb trees from a plantation of 35 to 40-year-old trees at Merseburg. They took seed from these and found that the seedlings preserved and showed the original characteristics. They then grafted the seedlings with morellos, wild cherries and scions of the same *P. Mahaleb* trees from which seed had originally been taken. The author found that considerable similarity in growth existed between types 1, 9 and 13, between 4, 5, 6 and 14 and between 2, 3, 7, 8, 11 and 12, while 10 was quite distinct from the rest. But as regards such characteristics as leaf colour, stippling and colour of shoots there was no such agreement. He gives photos of the general habit exhibited by the different types as also of shoot growth and of the leaves, which show clearly the great differences existing between the habit of different types, between the appearance of comparable shoots and between the size and shape of the leaves of different types. These types have not yet had time to prove their worth as rootstocks, but the author suggests that the extreme divergence found may well be found in their effects as rootstocks.

*Root growth.\**

13. ROGERS, W. S. 634.11 : 581.144.2  
Root studies. II. The root development of an apple tree in a wet clay soil.  
*J. Pom. Hort. Sci.*, 1932, 10 : 219-27, bibl. 1.

This is an account of an examination of the root system of a  $\frac{3}{4}$  standard Bramley's Seedling apple tree on seedling roots, about 26 years old, which was growing healthily on what appeared to be a practically waterlogged clay. Only a section of the system was disclosed, but this sufficed to show the following phenomena. The main roots which initially descend steeply, curve round to a horizontal position at a depth of less than 90 cm. (about 3 ft.). The bulk of the roots are growing in the clay between 50 and 90 cm., branch roots extending upwards to just below the surface and downwards to a maximum depth of 127 cm. Free water was found at 90-100 cm., while rushes grow freely in the grass. Apparently the region between 50 and 100 cm. possesses a balance of moisture and aeration which suits the roots better than soil above or below. Stagnant water conditions are apparently prevented by the slope of the orchard. Although the trees are 37 feet apart, a certain amount of root interlacing was found.

14. OTUKA, Y. 634.11 : 581.144.2  
Studies on the beginning period of the growth and the rest period of the apple root. (Preliminary note.) [Japanese-English summary.]  
*Res. Bull. Agr. Exp. Sta. South Manchuria Railway Co.* No. 5, 1931, pp. 1-12, bibl. 5.

Apple seeds of the variety *Malus baccata* Borkhausen var. *mandshurica* Schneider, the plant commonly used as an apple rootstock in Manchuria, were sown in bottomless wooden frames

\* See also 4, 5, 6, 103.



filled with soil and buried in the orchard at the Yugakujio Agr. Ex. Sta., S. Manchuria. The root systems of the resulting seedlings were washed out from selected frames at ten day intervals during the growing seasons of two years, and root and shoot length and dry weight were taken. Further data were obtained from a root observation box in which root growth against the glass side of the box was measured. Root growth was found to cease when the soil temperature at 30 cm. fell to 7°C., which was in the first ten days of November in that district. Root growth recommenced when the soil temperature rose again to 0°C. during the spring-thaw. This was in the last ten days of February in that district. [There are several obvious misprints in the legends of the interesting diagrams given, but they do not detract from their value.—ED.]

W.S.R.

*Growth, Nutrition, etc.*

15. NIETHAMMER, ANNELIESE. 581.14 : 581.192  
 Weitere biochemische Studien im Zusammenhange mit Fröhrtreibeproblemen.  
 (Further biochemical studies in connection with problems of spring growth.)  
*Gartenbauwissenschaft*, 1932, 7 : 1-6, bibl. 5.

Observations were made on the chemical composition of the branches of oak and lime at approximately monthly intervals between mid-August and mid-June. The author summarizes as follows: The polysaccharides stored in the membranes of the parenchyma cells of the cortex become changed during the yearly cycle. A certain connection can be traced between the growth tendency of the buds and the transformation of these substances. The occurrence of calcium oxalate sacs in the cortical parenchyma also varies during the year.

16. MURNEEK, A. E., AND LOGAN, J. C. 634.11 : 581.192 : 581.134.8  
 Autumnal migration of nitrogen and carbohydrates in the apple tree.  
*Univ. Missouri Coll. Agr., Agr. Exp. Sta. res. bull.* 171, 1932, pp. 30, bibl. 30.

A short account of previous work in this field is followed by a description of the methods adopted by the writers and the data obtained. Analyses were made in October, November and December of leaves, both abscised and still on the tree, of spurs and of 1 to 3-year-old branches for nitrogen, total sugars, starch, hemicellulose, carbohydrates. Their results lead the authors to conclude that the following autumnal changes occur: (1) The nitrogen content of the leaves decreases from the end of active growth until the occurrence of complete defoliation. The removal of nitrogen was found to be greater from the yellowed leaves than from green ones collected at the same time. (2) The percentage of nitrogen in non-bearing spurs and twigs increases rather uniformly during the period of dropping of leaves. Later much of this absorbed N is moved to older wood and probably to the root system of the tree. (3) The actual nature of the migration of carbohydrates from the foliage to the woody structures has not been determined. With the onset of cold weather starch and possibly other more complex carbohydrates are hydrolysed simultaneously into sugars in all peripheral regions of the tree. With changes in temperature condensation may again take place. Modifications induced by weather may often submerge a possible seasonal trend.

17. VYVYAN, M. C., AND EVANS, H. 634.1/2 : 581.45 : 519  
 The leaf relations of fruit trees. I. A morphological analysis of the distribution of leaf surface on two nine-year-old apple trees. (Laxton Superb.)  
*J. Pom. Hort. Sci.*, 1932, 10 : 228-70, bibl. 30.

The authors first review at some length previous work in this field, noting that it has established the following facts: (1) The leaf relations may vary considerably with the fruiting condition of the tree and the treatment it has received. (2) The leaf relation of different types of growth, e.g. the non-bearing and the bearing spurs, may be dissimilar and respond differently to changes

in conditions. (3) The relative numbers of these different types of growth may vary from tree to tree and from season to season on the same tree.

They then describe a simple measuring apparatus which they call an "integrator," the essential part being a sheet of glass accurately divided into squares of 1 centimetre by 2 sets of lines. The leaves are measured in the orchard without detachment from the tree. Details are given of the actual measurements taken and the methods adopted for taking them. The results are then presented and analysed statistically. The following points may be noted from their summary. The leaves examined consisted of every undamaged leaf on two Laxton Superb trees, one being on the dwarfing Malling IX stock and the other on the vigorous Malling V stock. The growths were separated into (a) primary spurs, which had borne blossoms; (b) primary non-bearing spurs; (c) primary long shoots; (d) secondary growths. Within these categories growths were grouped according to the number of their leaves. On each tree the size of the leaf varies with (a) the nature of the growth bearing it; (b) the number of leaves on the growth; (c) the position of the leaf on the growth. On long shoots the largest leaves occurred near the apex and the base, those in intermediate positions and at the extreme apex and base being smaller. The mean length of stem, the mean internode length and the mean and total leaf areas were greater on the No. V stock, but the leaf area per unit length of stem was less than on the No. IX. The greater total leaf area on the No. V was due (a) to a larger total number of growths; (b) to a smaller proportion of small-leaved "bearing" spurs; (c) to the presence of more numerous growths with large leaf numbers; (d) to the mean size of leaf being greater in all categories except the secondaries. A regular alternation was revealed in the relative amount of primary and secondary stems on the No. IX, which was directly associated with the fruiting and blossoming of the tree.

18. MATULA, E. 634.1/2 : 581.11  
 Saugkraftmessungen an Obstgehölzen. (**The measurement of absorption capacity in fruit trees.**)  
*Gartenbauwissenschaft*, 1933, 7 : 399-406, bibl. 6.

The author states the aim of the experiments to be the determination of absorption capacity maxima and of their relation to ascertained characters, such as drought resistance, and ultimately of the physiological relationships between stock and scion. While certain other fruit varieties are dealt with more shortly, results with some 28 apple and 11 pear varieties are tabulated. The author concludes as follows: 1. Since fruit seeds will not germinate in sugar solution, the measurements were taken on roots grown in gradually increasing sugar concentrations from seeds germinated previously, the observations being made on plasmolysed cells. 2. Absorption capacity maxima varied as follows: Apples 7.6-17.3 atmospheres, pears 9.9-18.5 at., cherries 11.1-20.4 at. (sweet cherries about 21.9 at.), peaches 11.7-12.7 at., apricots 8.4-13.7 at., plums (*P. domestica*) about 11.9 at., walnuts about 15.5 at. 3. Cultivated varieties generally showed higher maxima than wild varieties. 4. Generally speaking dessert varieties of pome fruits showed higher maxima than pome fruits used for other purposes. 5. Perry pears provided an exception. 6. Apple varieties suitable for growing in hotter districts showed higher maxima than other apples. 7. Fruit varieties with a high absorption capacity are more drought resistant than those with a low capacity.

#### *Pollination.*

19. FOX WILSON, G. 634.1/7 : 581.162.3  
**Insect visitors to fruit blossom.** (Being contributions from the Wisley Laboratory LXV—Pollination in orchards VIII.)  
*J. Roy. Hort. Soc.*, 1933, 58 : 125-8.

Details with notes on habits are given of insect visitors to fruit blossoms observed at Wisley between 1920 and 1930.



The author notes that the important factor for pollination is the number of visits by an individual and not the promiscuous visits of different individuals. The most important factors affecting the number of pollinating agents in fruit plantations are firstly those within the grower's control. These include (1) the site of the plantation, whether excessively shaded or insufficiently sheltered, etc., (2) method of planting, thus humble bees have been observed to neglect the flowers of currants and gooseberries when these are growing close to cherries, a fact which might have a serious effect under adverse climatic conditions, and (3) the presence of hives of bees. Secondly there are factors outside the grower's control, e.g. (1) climatic conditions, conspicuousness and attractiveness of the flower, thus apples bearing pink flowers have been observed to be less favoured by bees than those with white flowers; (2) inter-relation of the fruit blossoming period and flight period of insects; (3) sex ratio, thus the female humble bee (*Bombus* sp.) and wild bee (*Andrena* sp.) fly longer and visit more flowers than the male. Records taken at Wisley show that the visits of pollinating agents of fruit flowers of the *Rosaceae* may be put in the following order: *Hymenoptera* (1) hive bees; (2) wild bees (*Andrena* sp.); (3) humble bees (*Bombus* sp.). *Diptera* (1) fungus gnats (*Sciara* sp.); (2) fever flies (*Dilophus* and *Bibio* sp.); (3) anthomyids (*Anthomyidae*); (4) flower flies (*Syrphus* sp.); (5) drone flies (*Eristalis* sp.); (6) muscid flies esp. *M. autumnalis* (*corvina*); (7) bluebottles (*Calliphora erythrocephala*).

Tables are given containing: (1) some indication of the numbers of important pollinating agents visiting apple, pear, quince, medlar, cherry, almond, apricot, peach, plum, loganberry, raspberry, strawberry, black currant, red currant and gooseberry. (2) the number of different species of insects taken on the above fruit flowers as well as on those of blackberry, cob and filbert nuts and walnuts at Wisley between the years 1920-1930. Finally, there is a complete list of insect species taken and in very many cases concerned in the pollination of hardy fruits flowers at Wisley during that period. Most usefully the author differentiates in the list between the pollination importance of the insects concerned and also as to the business of these insects, whether sucking nectar, feeding on pollen or otherwise occupied.

20. HOOPER, C. H. 634.1/7 : 581.162.3

**The insect visitors of fruit blossoms.**

*J. Roy. Soc. Arts*, 1932, 81 : 86-105.

A lecture delivered before the Royal Society of Arts giving an account of particular insects found to visit particular fruits. The life history of the bumble bee (*Bombus ruderatus*) is given and shorter notes on the habits of other insect visitors. Visitors from the *Hymenoptera*, *Diptera*, *Coleoptera*, *Lepidoptera*, receive attention, as well as thrips, earwigs, mites and spiders. Not only is the article valuable to students of pollination problems in the orchard, but it is written with the author's usual human touch, which makes the driest list a delight to read.

21. NEBEL, B. R. 634.11 : 575.18

**Xenia\* and metaxenia\* in apples.**

*New York State Agr. Exp. Sta. Geneva, tech. bull.* 170, 1930, pp. 16, bibl. 13, and

NEBEL, B. R., AND TRUMP, IRIS J.

**Xenia and metaxenia in apples. II.**

*Proc. Nat. Acad. Sci.*, 1932, 18 : 356-9, bibl. 7.

NEBEL, B. R.

**Metaxenia and xenia in apples.**

*Proc. 6th Int. Congr. Genetics*, 1932, 2 : 140-1.

In the first article fairly full details of the author's technique are given together with results tabulated and graphed. In the second his experiences are summed up as follows: In 1930 metaxenial effects were found in the crosses Faineuse × McIntosh and Faineuse × Yellow Bell-flower. Here the metaxenial influence concerned height, breadth and probably weight of

\* Nebel, following Swingle, uses "xenia" in the sense of differences in shape or colour in strictly hybrid tissue brought about by the influence of foreign pollen, and "metaxenia" for differences due to the same cause in parts other than the embryo and the endosperm.—ED.

apples. Acidity and sugars were not examined. In 1931 in the crosses McIntosh × Yellow Bellflower, and McIntosh × Red Astrachan metaxenia effects were recorded on the weight of apple as well as on their acidity in terms of pH values and titration. These show that the keeping quality is affected in favour of the latter combination. In 1930 and 1931 Yellow Bellflower pollen produced apples of relatively inferior quality. Xenia was also observed in all the sets of apples examined, there being, for example, significantly greater seed length in apples from Yellow Bellflower pollen than in those from Red Astrachan. Seed weight and seed length were not found divergent in these two groups. The third article is a half page summary of the author's results.

## 22. MURNEEK, A. E.

634.11 : 581.162.3

**Apple pollination. An evaluation of methods and pollenizers.***Univ. Missouri Coll. Agr., Agr. Exp. Sta., res. bull.* 175, 1932, pp. 31, bibl. 36.

The old and most commonly used method is that of the paper bag. The equipment is inexpensive and readily movable from place to place and does not need expert handling. The author considers that disadvantages causing changed metabolism are the abnormal conditions of temperature, humidity and light supply obtaining in the enclosed bags. No type of bag has as yet been found ideal. A second method, called the "branch unit" method, has now gained wide recognition. Essentially it consists of the use of branches of a length that can be conveniently covered with a cheesecloth bag 6 ft. by 3 ft. Among advantages claimed over the paper bag method are: (1) A large number of flowers are covered and treated within a single enclosure, thus allowing more pollinations to be done in a given time. (2) Flowers on almost all parts of the branch are involved. The method thus approaches more nearly to orchard conditions. (3) The shading by the cheesecloth bag is almost negligible in effect. (4) Wind and rain affect cheesecloth much less than a paper bag. A third method, the great disadvantage of which is its cost, is that of wire-screen cages, whereby a whole tree or half a tree is enclosed together with a colony of bees. Advantages claimed include: (1) Need for much less skilled labour. (2) Use of entire tree involves every flower in every position for the determination of self and cross fruitfulness. (3) Environment and actual process of pollination more natural. (4) Facilitates gathering and study of various drops. The writer's 3 years comparative experiments show that the branch unit method is definitely preferable to the paper bag method and being less expensive and considerably more flexible will in his opinion probably be preferred to the screened cage method for ordinary orchard pollination studies. He describes his methods and the results obtained with various 19-20-year-old commercial apple varieties.

## 23. MORETTINI, A.

634.22 : 581.162.3

**Sull'autosterilità ed autofertilità dei susini. (Self-sterility and self-fertility in plums.)***L'Italia Agricola*, 1932, 69 : 961-83, bibl. 25.

The author first details concisely certain of the results achieved by previous workers, especially Waugh at Vermont, Crane and Lawrence in England and Philp and Vansell in California. He then gives an account of his own experiments at the R. scuola agraria media, Florence, Italy. He does not state the exact number of his observations in each case, but he notes that observations as to the opening of the first flowers, the date of full flowering [presumably judged by eye.—ED.] and the end of flowering were made on some 39 varieties, which were of about the same age and where possible worked on the same rootstocks. He also made tests of germination capacity on the above varieties. Special tests were also made in the case of Burbank, Shiro and Santa Rosa for self-sterility and self-fertility and details of the methods used are given. Controls consisted of uncastrated but otherwise similarly treated flowers. Less exact experiments were made with some 23 other varieties. Morettini's results agree largely with those of California, but in two cases differ from Kobel's results in Switzerland. Thus Giant and Agen were found by Morettini to be self-fertile, but by Kobel to be self-sterile and doubtful respectively. Summarizing his Italian experiments he brings out the following points. Early flowering is particularly noticeable in Japanese plums or crosses thereof. The flowering season of many early plums



does not overlap that of late flowering varieties. The pollen germination capacity tested in a 15% sugar solution varied from 15% in Shiro to 95% in Myrobolan, Imperial Epineuse and Prugna di Germania. Burbank was self-sterile, particularly good pollinators being Myrobolan, Santa Rosa, Shiro, Sultan and the ornamental *Prunus Pissardii*. Santa Rosa was sometimes self-fertile but derived great benefit from crossing with Myrobolan, Burbank and Shiro. Shiro proved self-sterile, good pollinators being Santa Rosa, Burbank and Myrobolan. Of others tried the following were found self-sterile: America, Bon-Bon, Botan, Combination, Imperial Epineuse, Heron, Ogden, Oberdan, Red June, Shiro, Wickson, Satsuma. The following were self-fertile in varying degrees: Chalco, Giant, Prugna Friulana, Prugna di Germania, P. d'Italia, P. di Letricourt, P. Minot, P. d'Agen, P. S. Caterina.

24. RIETSEMA, I. 581.162.3 : 634.23 + 634.22  
Bestuivingsproeven bij kersen en pruimen. (**Pollination trials with cherries and plums.**)  
*De Fruittelt*, 1932, 22 : 197-201.

A list of inter-fertile cherries suitable for planting in combination is given. A similar but more inconclusive list is given for plums. The well-known plum Dubbele Boerewitte of Knoop and Berghuis is synonymous with the Jungfern plum of Germany and the Vitt Jung plum of Sweden.

25. EINSET, O. 634.23 : 581.162.3  
**Experiments in cherry pollination.**  
*New York Agr. Exp. Sta. Geneva, bull.* 617, 1932, pp. 13.

This is a short account of results in cross and self-pollination experiments by the author in the years 1926-1928. He found that of the cherries tested by him Early Richmond, Montmorency and English Morello proved fully self-fruitful. The sour cherries were equally well pollinated by sour and by sweet varieties and all the 26 sweet cherries proved self-unfruitful, but were effectively cross pollinated by other sweet varieties. Duke cherries were found to vary in self-fruitfulness. Their blooming period coincides with or follows slightly after the last of the sweet cherries, hence suitable pollinators should be available among late blooming sweet varieties. None of the Duke cherries proved effective pollinators of sour, sweet or Duke varieties.

26. HOWORTH, H. G. 638.15  
**Acarine disease of bees.**  
*J. Min. Agr.*, 1932, 39 : 833-41.

The author describes the symptoms of attack by *Acarapis Woodi* and notes how it may be detected and spread. He then details the method of carrying out the Frow treatment, and finally briefly discusses a treatment by sulphur employed successfully in Switzerland and a treatment by oil of winter green (methyl salicylate), which is stated by the Staffordshire Education Committee to have given excellent results in that county when applied to colonies in the first stage of the disease.

#### Cultural Practices.

27. MORTON, J. W. 634.11-1.542.24  
**Bark-ringing and fruit production.**  
*Gard. Chron.*, 1932, 92 : 470.  
WALLACE, T.  
**Bark-ringing and fruit production.**  
*ibidem*, 1933, 93 : 31.

The second article is in reply to certain general assertions made in the first. Morton describes 3 forms of ringing, viz. the complete ring, the spiral and the system of 2 half rings. Neither he nor Wallace favour the spiral, as they consider that it has no advantages over the other methods, is difficult to carry out, while it is hard to know how far the spiral should be extended. Morton considers that complete ringing gives no control at all except by widening or narrowing the ring and may seriously endanger the health of the tree. Wallace disagrees entirely, pointing out

that to bring an unfruitful tree into bearing by ringing the essential point is to produce an efficient growth check. The complete ring is the most effective way of doing this, even though the width is only that of a saw cut. When neglected there is undoubtedly danger of damage to the tree and in this particular only has the half ring method an advantage. Properly handled the complete ring is effective and safe. Both agree that the half ring method should be entirely safe, though Wallace notes that as at present practised considerable damage often follows its use. Morton speaks of covering the wound with white lead paint, but Wallace condemns this practice utterly. It does not, he says, always prevent disease infection, while it does undoubtedly prevent efficient callusing over of the wounds. He recommends instead the use of 1 in. unmedicated insulating tape, which should be bound round the ring immediately after ringing. In most cases this will ensure the entire callusing over of the wound during the same season. Where callusing does not occur under conditions of white lead painting, Wallace points out that manuring can be of little value owing to the fact that the operation of ringing cuts off from the tissues above the ringing point a large proportion of the supplies of nitrogen. He qualifies Morton's statement that ringing improves the dessert quality of fruit by saying that dessert quality may indeed be greatly improved by ringing, but only during the period that the ring is not completely healed. Long Ashton research has determined that the improvement in quality is due to the change in composition induced. This change may actually result in decreased quality in the case of cooking varieties. Ringing has thus been found to have the following main effects on fruits: Increase in percentage dry matter, decrease in nitrogen content, increase in total sugars. Wallace further notes that ringing has great effect on storage qualities of fruits, fruits from ringed trees of such varieties as Bramley's Seedling being usually found to break down prematurely from such maladies as low temperature internal breakdown or superficial scald, while similar fruits from unringed branches have remained unaltered.

28. MARSHALL, R. E. 634.25-1.542  
**Pruning the peach. The effect of different pruning methods on yields, grades and returns for Gold Drop peaches.**  
*Q. Bull., Michigan State Coll. Agr., Agr. Exp. Sta., 1932, 14 : 284-90.*

Seven different pruning methods were tried beginning in 1924 on a 3-year-old block of Gold Drop peaches at Graham Hort. Exp. Sta., Grand Rapids. The methods used have been described and illustrated in *Michigan Special Bulletin* No. 184, pp. 14-22 and in *Michigan Technical Bulletin* 116. In the present article they are tabulated as: A. Severe dormant pruning; B. No pruning; C. Moderate dormant pruning and summer thinning; D. Moderate dormant thinning; E. Moderate dormant pruning and summer pinching; F. Bulk pruning; G. Light dormant pruning. Trees receiving no pruning produced materially higher yields than other groups in 1926 and 1928 and then declined to approximately the average of the groups. Groups A, C and E produced consistently low yields. Groups D, F, G gave consistently higher yields than the more severely pruned trees A, C and E. On the commercial side continuous lack of pruning produced a severe decline in the net returns per tree owing to unsaleable fruit. Severe pruning gave high grade fruit but brought low returns because of low yields. The highest net returns were for the lightly pruned groups D (moderate dormant thinning no heading), G (light dormant and heading back) and F (bulk pruning, signifying cutting out a few branches two, three and four years old). General recommendations are to prune lightly until a season when no crop is likely through winter killing or frost injury to buds and then to head back the trees into the 3- and 4-year-old wood.

*Harvesting and after-care.*

29. GOUDE, H. 634.11-1.556.1  
**The colouring of apples after gathering.**  
*J. Min. Agr., 1932, 39 : 904-6.*

The author describes a simple process for the colouring of apples after picking and prior to storing used at the Burlingham Horticultural Station. He notes that the ordinary cultivation methods adopted at the station secure a high proportion of well-coloured fruits. The green and poorly



coloured specimens are then finished off by what he calls the "Sun Dewing" method. The green fruits are packed with eyes upwards in one layer on a tray covered with inodorous wood wool or clean moss. The trays are placed on the roof, facing full south and are covered with fish netting to protect the fruits from birds. When in position the fruits are thoroughly wetted with clean soft water. They are not allowed to become dry, and in sunshine or drying winds water is sprayed over the fruit through a syringe or water can. If frost occurs, it is washed off the fruits before the sun's rays reach them. A coloured plate shows specimens of Allington Pippin, Laxton's Superb and Newton Wonder so exposed for 10 days and 10 nights from October 3rd, 1932. Sunshine was recorded on 3 days and total sunshine was only 12 hours. Heavy gales were experienced during the period. Among varieties said to respond well are Cox's Orange Pippin and Ellison's Orange. Apples with a greasy skin do not respond.

30. ALLEN, F. W. 634.13-1.547.6 : 664.85.13.037

**The harvesting and handling of fall and winter pears.**

*Univ. Calif. Coll. Agr., Agr. Exp. Sta. bull.* 533, 1932.

The author has previously published work\* on maturity standards for harvesting Bartlett pears for shipment East. He here turns his attention to varieties of pears which ripen later than the Bartlett. Results are similar to those obtained with the Bartlett. Too early picking leads to poor quality fruit liable to shrivelling and scald, delayed picking results in poor storage qualities. Colour and firmness supply a valuable index of maturity. It is noted that, irrespective of district, fruit harvested before some change in the original ground colour has appeared almost invariably fails to develop its optimum qualities. The initial softening of the flesh is inseparable from colour changes. Pressure tests must be properly made and must be interpreted in relation to colour changes and with reference to such influencing factors as climate, rootstock and size of crop. Suggested minimum colour requirements and maximum and minimum pressures for harvesting ten important varieties in three districts are tabulated. The rate of ripening of pears and the distance they will stand transporting are much influenced by the rate of initial cooling and by the temperature at which they are stored or shipped. Late pears ripen best after a period of storage, but should be removed previous to eating and ripened at 60°F. or above.

31. MORRIS, O. M. 634.25-1.547.6

**Peach maturity at harvest as related to quality.**

*Washington State Coll. Agr. Exp. Sta., bull.* 266, 1932, pp. 35, bibl. 12.

Peaches, mainly Elberta and J. H. Hale varieties, were picked showing different colours and registering different pressures, and were stored at different temperatures in 5 successive seasons. The writer concludes from his observations of results that a combination of pressure test and colour seems to be the best method of determining a standard for use in harvesting. Fruit should be adequately ripe in order to attain the highest quality. With such fruit, the ripeness of which has been determined by colour and pressure tests, storage temperatures varying from 40° to 50°F. kept the fruit in good condition, retarded the softening processes, but permitted final ripening, so that good quality fruit was drawn from the storage room from 5 to 15 days after harvest.

*Plant Protection.*

32. PARDY, A. A. 631.543.82

**Windbreaks and shelter belts.**

*Rhodesia Agr. J.*, 1932, 29 : 873-81, reprinted as *Ministry's bull.* 869.

After discussing the objects, advantages and disadvantages of windbreaks the writer describes the different types. 1. *Single rows.* A disadvantage is the necessity for each tree to be functioning to the best advantage all the time. If, moreover, fast growing species are used,

\* *Calif. Agr. Exp. Sta. bull.* 470, 1929.

the lower part is apt to open out with increasing age, and if slow growing species are used, the belt only slowly becomes effective. 2. *Two rows.* The row on the windward side should be of fast growers such as eucalypts, that on the leeward side of slow growers such as conifers. 3. *Three rows.* Here there is more scope for the removal of trees for fuel or timber. The preferable arrangement is two rows of eucalypts on the windward and 1 row of conifers on the leeward side. 4. *More than three rows.* Such a type can be regulated cuttings be used also for the production of fuel and timber. It should consist of one or more rows of eucalypts and one or more rows of conifers and other slow growing species. 5. *Trees singly and in groups.* Suitable for areas devoted to cattle grazing. The sheltering effects of a wind break are felt for two to five times its height on the windward side and from ten to twenty times on the leeward side. If planted with fast growing species a windbreak has an appreciable effect when two to three years old and by eight to ten years it should be fully effective.

33. SCHOWENGERDT, G. C., AND WEST, D. C. 634.11-1.55

**Factors causing cull apples in Missouri.**

*Univ. Missouri Coll. Agr., Agr. Exp. Sta., bull. 319, 1932, pp. 30.*

The results of two years' observations covering apples produced by the general farmer as well as the specialist fruitgrower. Lack of size caused more low grade apples in both years than any other single factor. Insufficient colour and mechanical injury were two physical factors of major importance. Of insects codling moth, curculio and aphids caused the largest percentage of culls, while scab, blotch and cedar rust were the most destructive diseases on the apple fruit.

34. AUSTIN, M. D., AND OTHERS. 632.94/95

**Some new insecticides and possible insecticide-fungicide combinations.**

*Horticultural Education Association Year Book for 1932, 1: 85-92, bibl. 4.*

Experimental data on the control in the field of the hop damson aphid and the apple sawfly enable the writers to express definite opinions on the merits or characteristic properties of the following: Anabasine with sodium oleate or sulphite lye as a spreader; rotenone (1:75,000) in freshly prepared diacetone alcohol solution with spreader as before; tinocine D  $\times$  nictagral A (no spreader needed); cottonseed oil; bordeaux mixture 4:6:100 + 0.75% cottonseed oil; bordeaux mixture 8:12:100 + 0.75% conc. sulphite lye (60°Tw). They found also that the soap solution prepared by adding oleic acid to dilute solutions of NaOH is a satisfactory substitute for soft soap. Under their conditions Grenadier, Early Victoria and Newton Wonder apple foliage remained undamaged by the application of the two modified bordeaux mixtures given above.

35. MARTIN, H. 632.94/95

**The present uses and future development of spray spreaders.**

*Horticultural Education Association Year Book for 1932, 1: 76-84, bibl. 24.*

The author summarizes his article as follows: (1) It is suggested that the term spreader be confined to materials, the principal function of which is to increase the ability of the spray to wet, in order that they may be differentiated from spreaders which serve mainly to enhance the retention of spray deposit. (2) The mechanism of spreading action is discussed and methods of comparing the efficiency of spreaders by measurement of the surface tension of their solutions are shown to be inadequate. (3) A method is given for preparing soap solutions whereby the boiling-up process commonly used to prepare soft soap solutions is avoided. (4) The limitations of soaps as spreaders are described and progress made in the production of synthetic spreaders is discussed. (5) It is suggested that concentrated sulphite lye, a by-product from wood pulp manufacture, may be a useful and cheap spreader. (6) The possibility of using certain waste products of petroleum oil refining is discussed. (7) Illustrations are given of the effect of the addition of spreaders on the toxic action of certain fungicides in order to show that recommendations regarding the use of spreaders should not be made without satisfactory field trials.

36. SCHMITT, N. 632.951.1  
 Kultur-u. Absatz der *Derris elliptica*. (Culture and supply of *D. elliptica*).  
*Tropenpflanzer*, 1932, 35 : 375-80.

The author gives details of the method of growing derris, which would appear to have changed little in many years, and consists of raising from cuttings owing to the infrequency with which seed is formed. As sources of cuttings to intending growers he cites Culturtuin at Buitenzorg, Java; Deli Proefstation, Medan, Sumatra; Agr. Dept. S.S. and F.M.S. Kuala Lumpur; and the Agr. Exp. Sta., Serdang. His account of the present commercial position is of particular interest and he gives a list of the larger commercial undertakings concerned in derris production. They are: Caoutchouc Maatschapij in Sumatra. In Java a Malayan planter has planted up a large area. McDougall and other firms have derris plantations in Federated Malay States, while a Japanese firm controls its production in Johore. Sarawak had 2,000 acres under derris in 1929. The author stresses the necessity of some standard whereby the buyer can more accurately gauge the insecticidal value of derris on the market. He considers that attempts to extract the rotenone and export in this form have not as yet been very successful. Rather more successful but tending nevertheless to lose its toxicity in course of time is a concentrated emulsion made by the Deli Proefstation. 100,000 litres were made in 1930 and used with good effect in Java.

The Japanese dissolve the active principle in a fish oil, the product being patented. McDougall in England and six or seven firms in Germany put derris on the market in different forms. Prices are quoted from the markets of the different countries where derris is produced. Consular reports show that the whole of the important derris output for the next few years is already bought. It is possible that plants with constituents of even greater toxicity, e.g. *Lonchocarpus nicon* (South America), *Tephrosia Vogelii* and *T. macrophylla* (South Africa) may be found, or a method devised for synthesizing artificially the toxic elements required. Failing this the author considers that derris offers considerable promise as a crop in tropics and sub-tropics.

37. ANAGNOSTOPOULOS, P. TH. 634/635-2.48  
 Some diseases of fruit trees, vegetables and flowers caused by *Fusarium* sp.  
 in Greece. [Greek-English summary 2 pp.]  
*A.B. Pasca, Athens*, pp. 23, price 20 drachmae.

The author discusses the following diseases said to be caused by this fungus: Blackening of *Pistacia vera* by *F. oxysporum*; cankers on pears, *P. communis* and *P. amygdaliformis*, caused by the same fungus; gumming of almond, cherry and apricot again attributed to the same organism; potato and tomato wilts; chlorosis, root rot and unfruitfulness of *Vicia Faba*; onion rot. *Fusarium* sp. is also noted as causing stem rot of carnations, wilt of stocks and wilt of asters.

38. DOWSON, W. J. 632.314 : 634/5  
 Notes on some bacterial plant diseases in Tasmania.  
*J. Pom. Hort. Sci.*, 1932, 10 : 301-5, bibl. 10.

The diseases discussed are: Halo blight of beans (*Bacterium medicaginis* var. *phaseolicola*), Bacterial spot of cauliflowers (*Bacterium maculicola*), Walnut blight (*Bacterium juglandis*), Mulberry blight (*Bacterium mori*).

39. KÖHLER, E. 632.8  
 Allgemeines über Viruskrankheiten bei Pflanzen. (Some general remarks on plant virus diseases.)  
*Angewandte Botanik*, 1932, 14 : 334-48, bibl. 30.

This was a lecture delivered to the German Botanical Society. The author deals in general terms with the problem of virus diseases and notes that insufficient attention has hitherto been paid to it in Germany. He stresses the importance that the incidence of such diseases must have for all physiological research workers and goes so far as to say that the deductions from certain



unnamed physiological experiments on plants belonging to the *Solanaceae* and *Leguminosae* can no longer be upheld in view of the virus factor having been neglected in those experiments.

With regard to virus diseases the author makes the following points. *Definition.* This still remains in doubt, though general opinion is that a virus is a living organism. It is not even certain that all are filtrable through bacterial filters. *Characteristics.* In a susceptible plant a virus will spread to every part, though its greatest activity is generally found in the growing leaves. It may lie dormant in a plant supposed to be healthy. The susceptibility of different virus diseases to environment, especially outside the plant, of a physical or chemical nature varies tremendously. Thus the tobacco mosaic in extracted plant juice can be dried, kept for years in liquid form, diluted to 10<sup>5</sup> and still be virulent, while the exact opposite is the case in sugar beet mosaic. *Method of spread.* A certain method is the vegetative propagation of the affected part. Insects are also found to carry the infection and in certain cases the spread of a virus disease is found to coincide with that of a particular insect or group of insects, e.g. curly top of beets and *Eutettix tenellus* in the semi-arid districts of the western United States.

In some cases the infection is merely carried mechanically, in others it would seem that the insect acts as a host in which the virus exists and even possibly develops. The power to infect may persist from the infected larva to the perfect insect, but is not transmitted to the next generation. There is no proof that virus is inherited through the seed of infected plants, though it may be transmitted by seed. Very rarely infection seems to lie in the soil, but in such cases it is probably due to the presence of infection-bearing insects. Its spread in the plant itself is both by diffusion and translocation through the living tissue. Its spread varies also with the different parts of the plant, with the temperature, and with the availability of plant nutrients.

*Resistance to virus.* In some cases the virus may be present but possess only trifling effect, in others it may be introduced and stay where it is without spreading at all. *Susceptibility in the plant kingdom.* Certain families such as the *Solanaceae* would appear to be particularly susceptible. *Specific strains of same virus.* It is probable that different strains exist, though all that has been proved so far is that the virulence of a virus may increase or decrease after passing through a number of plants and at some future time return to its original power.

40. ANAGNOSTOPOULOS, P. TH. 632.2-2.3/7

**Gummosis of stone fruits, its causes and its control.** [Greek-English summary.]

A.B. Pasca, Athens, pp. 42, price 40 drachmae.

The author discusses the incidence of gumming in almond, cherry, prune and apricot. He notes the chemical and physiological processes concerned and the different agents which contribute to their incidence. Among them he notes: *Bacterium tumefaciens*, *Monilia cinerea*, *Coryneum Beijerinckii*, *Fusarium oxysporum*, also *Capnodis tenebrionis*, *Heterodera radicicola* and *Cecidomyia amygdali*.

41. LOEWEL, E. L. 632.48 : 634.1/2

Das Auftreten des Fusicladiums im Altländer Obstbauggebiet in seiner Abhängigkeit von Klima, Standort, Obstarten und -sorten und seine praktische Bekämpfung auf Grund zweijähriger Versuche des Obstbauversuchsrings. (The incidence of *Fusicladium* in the fruit region of Altenland in relation to climate, variety and kind of fruit, and its practical control based on a two year trial made by the Fruit Research Group.)

Angewandte Botanik, 1932, 14 : 233-77 and 281-333, bibl. 66.

A trial of bordeaux, lime sulphur and Nosprasil on different fruits at different times and at different concentrations leads the writer to draw up a spraying calendar, which members of his research group are advised to use. A questionnaire is also presented for their use in which they are asked to give details of winter spraying and note the success or effect of their treatments in various ways.

42. MOORE, M. H. 634.11-2.42-1.541.11  
**Further studies on the incidence and control of apple scab (*Venturia inaequalis*) and apple mildew (*Podosphaera leucotricha*) at East Malling.**  
*J. Pom. Hort. Sci.*, 1932, 10 : 271-94, bibl. 5.

This is an account of a 4th year's investigations at East Malling, the results of the first three years' work having been described previously in *J. Pom. Hort. Sci.*, 1930, 8 : 229-47 and 283-304. Results in the main confirmed the author's previous findings. Bordeaux though providing the best scabicide showed a tendency to cause spray injury and was not efficacious against apple mildew or red spider. Lime-sulphur gave very good control of scab, mildew and red spider, especially when given once before and twice after blossoming. The importance of the pre-blossom "pink bud" application was again emphasized. Rootstock effect was noticeable in scab susceptibility but appeared to be governed to some extent by seasonal conditions. The trees investigated were Cox's Orange Pippin on different known rootstocks. Data, which will be presented elsewhere, on records of apple sawfly (*Hoplocampa testudinea*) attacks and control tend to show that there was a better control of this pest on Cox by a fungicide with lead arsenate than with lead arsenate alone. As regards apple mildew lime-sulphur was found to be the most effective spray of those tested on Cox's Orange Pippin, bordeaux and colloidal sulphur proving rather unsatisfactory. On Belle de Boskoop soda-soap solution (20-10-100), lime-sulphur (1-100) and a sulphur dust gave the best results in 1930. All were applied twice after blossoming. The author notes, however, that soda-soap solution was harmful in 1929 and that lime-sulphur proved unsafe in both 1929 and 1930, while sulphur dust was of doubtful safety in 1929. As regards rootstock influence Cox's Orange Pippins on No. I were especially susceptible, while those on Nos. XVI, IV and XV were resistant to mildew. Details of spray injury on this apple are discussed.

43. PARHAM, B. E. 632.42 : 634.11 + 634.13  
**Apple and pear black spot (scab).**  
*New Zealand J. Sci. Tech.*, 1932, 14 : 184-92, bibl. 8.

Comparative records of the ascospore discharge of *Venturia inaequalis* (Cke) Aderhold and *V. pirina* Aderh. throughout New Zealand in the spring of 1931. A seasonal comparison between records secured at Nelson in 1921 and in 1931 indicates a marked regularity in the behaviour of the fungi from season to season as regards both the total period of ascospore discharge and the regular occurrence of the maximum discharges for the season during the last week in September and the first two weeks in October.

44. WEBBER, R. T. 632.78 : 632.96  
***Sturmia inconspicua* Meigen, a Tachinid parasite of the Gipsy moth.**  
*J. Agr. Res.*, 1932, 45 : 193-208, bibl. 10.

An account of its life history and habits. It is an effective parasite of the gipsy moth (*Porthetria dispar*, as also of the pine sawfly (*Diprion simile*). The latter has been recently introduced into the north eastern States of the U.S.A. It is thought that *S. inconspicua* will prove very valuable against these two pests.

The following also are noted :—

- ANON. **The Imperial Fruit Show, 1932.** *J. Min. Agr.*, 1932, 39 : 841-5.  
 STANSEL, R. H., AND WYCHE, R. H. **Fig culture in the gulf coast region of Texas.** *Texas Agr. Exp. Sta. bull.* 466, 1932, pp. 28.  
 LEWIS, I. P. **Grafting and budding fruit trees.** *Ohio Agr. Exp. Sta. bull.* 510, 1932, pp. 22.  
 PHILLIPS, E. F. **Definitions of honey color grades.** *J. Agr. Res.*, 1932, 45 : 757-70, bibl. 4.  
 WAGENINGEN. **Bestuiven en bestuivens. (Dusting and dust machines.)** *Versl. en Meded. Plantenziektenkundigen Dienst te Wageningen*, No. 67, 1932, pp. 23. A well illustrated article on the latest recommendations re dusting and dusting apparatus in Holland.

- STÄGMEYR, E. Zur Bekämpfung der Blattrandkrankheit im Obstbau. (**Leaf scorch control in the orchard.**) *Ernährung der Pflanze*, 1932, **28** : 382-4.
- CATION, D. **Three virus diseases of the peach in Michigan**, *Michigan Sta. Coll. Agr. Exp. Sta. circ. bull.* **146**, 1932, pp. 11.
- SMITH, R. E. **The diamond canker disease (*Dematium pullulans*) of the French prune in California.** *Calif. Agr. Ext. Serv. circ.* **67**, 1932, pp. 22.
- SVOLBA, F. Rusztau an *Prunus domestica*. (Sooty mould (*Dematium pullulans*) on *P. domestica*.) *Gartenbauwissenschaft*, 1932, **7** : 282-92, bibl. 11.
- WIESMANN, R. Untersuchungen über die Ueberwinterung der Apfelschorfpilzes . . . . . (**The over wintering of *Fusicladium dendriticum* on dead leaves and the spread of its summer spores.**) Reprint from *Landwirtschaftliches Jahrbuch der Schweiz*, 1932, pp. 619-79, bibl. 46.
- WORMALD, H. **Bacterial diseases of stone-fruit trees in Britain. IV. The organism causing bacterial canker of plum trees.** *Trans. Brit. Myco. Soc.*, 1932, **17** : 157-79, bibl. 5.
- ARAKAWA, H. G. **The pear flower bud weevil (*Anthonomus pomorum*) in South Manchuria.** [Japanese-English summary 1½ pp.] *Res. Bull. Agr. Exp. Sta. South Manchuria*, No. **5**, 1931, pp. 13-39.
- ARAKAWA, H. G. **The leek leaf beetle (*Galleruca* sp.) in South Manchuria.** [Japanese-English summary 1½ pp.] *Res. Bull. Agr. Exp. Sta. South Manchuria*, No. **5**, 1931, pp. 41-50.
- HAEUSSLER, G. J. ***Macrocentrus ancylivorus* Roh., an important parasite of the oriental fruit moth (*Laspeyresia* *Grapholitha molesta*).** *J. Agr. Res.*, 1932, **45** : 79-100, bibl. 8.

## SMALL FRUITS, VINES, NUTS.

45. VAN DER LEK, H. A. A. 634.723.1-1.535.4 : 581.144.2  
Versuche über den Einfluss von niedrigen Temperaturen auf die Wurzelbildung von Stecklingen. (**The influence of low temperatures on root formation in cuttings.**)  
*Gartenbauwissenschaft*, 1933, **7** : 365-81.

Black currant cuttings were exposed to various temperatures for about three weeks prior to planting with the intention of influencing rooting by a change in the materials available for growth. Very little effect was obtained by treatment in October-November. Later in the rest period pre-cooling produced slight improvement in root production, the effects of different temperatures varying with the season. When material was taken in February and treated during March, cuttings cooled below zero rooted much more freely than those subjected to temperatures of + 2°C. and + 9°C. Although the former produced slightly fewer roots, their total length was three times, and their dry weight more than five times as great as in the case of the latter. Callus development is also increased.

The author suggests that some growth stimulant may be associated with storage starch and that cooling makes this available through its influence on carbohydrate metabolism. R.C.K.

46. VOGEL, F., AND WEBER, E. 634.722-2.19  
Zur Blattrandkrankheit der Johannisbeere. (**Leaf scorch disease of currants.**)  
[English summary.]  
*Ernährung der Pflanze*, 1932, **28** : 165-7, bibl. 11.

Observations on different varieties of currants at Weihenstephan in 1932 showed leaf scorch symptoms in a number of bushes. The symptoms were first yellowing and later browning of the leaf margins, which then started to curl downwards resulting in complete withering of the



affected bushes before the end of July. The authors note that the low potash content of the leaf ash of the diseased plants together with the fact that the subsoil round these plants was poor in potash seems to indicate that the scorch was due to potash deficiency.

47. FISCHER, R. 634.72-2.19  
Versuche zur Bekämpfung der Blattrandddürre der Johannis und Stachelbeeren in Österreich. (**Control of leaf scorch on gooseberries and currants in Austria.**)  
[English summary.]  
*Ernährung der Pflanze*, 28 : 440.

This is an account of the phenomena of leaf scorch caused by wind and by potassium deficiency. The wind-caused symptoms occur suddenly, while those due to lack of potash are more gradual in their incidence. Controlled experiments with applications of 12 gm., 25 gm., 50 gm., 75 gm. and 150 gm.  $K_2SO_4$  per square metre and per bush showed that the disease was entirely controlled by the higher doses.

48. RAWES, A. N. 634.75-1.521  
**Trials of hardy fruits for commercial purposes : strawberries at Wisley.\***  
*J. Roy. Hort. Soc.*, 1933, 58 : 161-70.

These trials have established the existence of synonymy between Deutsch Evern and Tuckswood Early, Early Evern and Rufus ; Royal Sovereign and King George V ; Leader and Kentish Favourite ; Vicomtesse Héricart de Thury, Stirling Castle and Garibaldi ; Jucunda and Amazone ; Madame Kooi and Princess Juliana. Moreover they have shown that McMahon and Lord Overton, while distinct from Givon's Late Prolific, often masquerade under that name. It is considered that unqualified recommendation cannot be given to Oberschlesien and Tardive de Leopold, which are now extensively grown, owing to the inferior quality of their fruits when compared with the standard varieties Royal Sovereign and Sir Joseph Paxton. Royal Sovereign still remains the best of the early-ripening varieties followed by Oberschlesien and Sir Joseph Paxton with Tardive de Leopold the best of the lates. For canning Sir Joseph Paxton is outstandingly the best. Oberschlesien and Tardive de L. are not completely satisfactory. Or du Rhin, Aberdeen Standard and Brenda show promise. Descriptions are given of some 16 varieties under trial.

49. DARROW, G. M., AND WALDO, G. F. 634.75  
**The Dorsett, Fairfax and Narcissa strawberries.**  
*U.S. Dept. Agr. circ.* 257, 1933, pp. 6.

A description of 3 new strawberries, which give fair promise in the Eastern United States. Dorsett and Narcissa certainly and probably Fairfax all originated from crosses of Royal Sovereign  $\times$  Howard 17.

The following also is noted :—

STREETER, F. **The strawberry.** *J. Roy. Hort. Soc.*, 1933, 58 : 11-15.

50. ADDOMS, RUTH M., AND MOUNCE, F.-C. 634.76-1.8  
**Further notes on the nutrient requirements and the histology of the cranberry, with special reference to the sources of nitrogen.†**  
*Plant Physiology*, 1932, 7 : 643-56, bibl. 12.

Young plants were grown for two months in sand cultures supplied with nutrient solutions containing nitrogen in the form of calcium nitrate, ammonium sulphate, and glycine and repeated with reactions of pH4, pH6 and pH8. The experiments show that the cranberry can utilize several sources of nitrogen. They confirm the findings of Tiedjens and Robbins with certain other plants that in sand cultures nitrate can be utilized to best advantage in acid solutions and ammonium in more nearly neutral or in alkaline solutions. Of the reactions tried

\* See also *H.A.*, 1932, 2:4:318.

† See *H.A.*, 1932, 2:1:35.

glycine was most successful at pH4. Mycelium of the endophytic fungus was found throughout the stem tissues, especially in parenchyma, and in the cells of embryonic tips. The amount appears to be directly correlated with the vigour of vegetative growth. The authors suggest that in the cranberry, as probably in other plants, there is little difference in histology and composition of elaborated materials between plants that have attained the same degree of vegetative vigour, although they may have been grown under different environmental conditions. [From authors' summary.]

## 51. STRICKLAND, A. G., AND OTHERS.

634.8 : 581.084.2

**A vine uniformity trial.***J. Agr. Victoria* (Australia), 1932, 30 : 584-93, bibl. 7.

This paper describes a uniformity trial carried out on some 125 individual vines worked on vegetatively raised rootstocks in a commercial block at the Viticulture Station, Rutherglen, in 1930.

It is shown that the variation was due to two main causes, (i) inherent individual variation between vine and vine, and (ii) that due to external causes. Having eliminated that part due to soil gradients, a variation co-efficient of 33.4% for individual vines was found. Increasing the size of the unit, plots of 8 vines were found to give a variation co-efficient of 8.7% and this was considered to be the optimum plot size. Nine replications of a plot of this size would show differences of some 10% and four replications of 20%. Although it is probable that long narrow plots generally give more accurate results than square plots, practical considerations and economy of ground and material render the latter more desirable. Comparisons were made between the standard deviation obtained and those in a uniformity trial of wheat. It was found that, whereas the correlation between adjacent 1/160 acre plots in the wheat trial was high and positive, that between adjacent vines was comparatively insignificant. This was accounted for by the relatively high inherent variability of the individual vines. In the case of the wheat plots the large number of plants per plot would naturally render this comparatively unimportant.

T.N.H.

## 52. STEINGRUBER, P.

634.8-1.521

Die Grenzen des Erfolges bei Selektion im Weinbau. (**The limits of successful selection in viticulture.**)

*Gartenbauwissenschaft*, 1932, 7 : 178-95, bibl. 29.

While certain data are given from the author's station at Klosterneuburg near Vienna, the paper is largely a résumé of results achieved by workers on selection in the vineyard and of the opinions of certain workers on the question of senescence.

The author notes that although Bioletti had little success with selection in America, evidence of its value in other fruits at least is afforded by Shamel and Davis in that continent, whilst in Europe there is ample evidence of the good effects of selection within a variety. Evidence is quoted from Klosterneuburg of the great improvement achieved at the research station by selecting Österreichisch Weisz and Rotgipfler vines. In the first beds from which selection was made the percentage figures of good and bad bearers were respectively 44 good to 56 bad and 46 good to 54 bad respectively. After selection from among the good bearers only the percentages in the new beds were found to be 55 good to 45 bad and 64 good to 36 bad respectively. This indicates the practical value of selection but also raises the question as to why the result is not even more striking. The author discusses the factors which appear to influence the success of selection. *Degeneration*. Forcing a vine to give more than it has the capacity to give each year has bad effects. As an example of over-ruthless selection he cites the Froelich-Sylvaner variety, a much selected selection from Germany. This has broken down completely in cultivation in the Austrian nurseries at Krems, while Kobel reports the same from Switzerland. [The author does not in this instance discuss soil conditions.—ED.] This variety was subjected to continuous selection in the  $F_2$  and  $F_3$  generations. At Klosterneuburg other varieties which

have not suffered such persistent selection have by judicious selection been greatly improved, e.g. Veltliner Grün, Österreichisch Weisz, Rotgipfler and Sylvaner Rot. Stummer and Frimmel report, moreover, from Germany that all their selections for high yielders continue to grow well and crop successfully. They note that this may be due to the fact that the mother stocks were about 16 years old and that the soil was good. Selectors in the author's opinion must beware of asking too much from a plant or of propagating from very old plants. He evidently supports the theory of senescence, for he quotes several instances cited by various authorities which seem to support it, e.g. Benedict writes that cuttings from old plants produce new plants, but these plants show the small veining characteristic of old plants, while Molisch states that a scion taken from an old tree grows feebly and soon produces blossom and fruit, while that from a young seedling grows quickly and fruits only after a considerable lapse of time. On the other hand he notes the statement of Stummer and Frimmel that they have not yet succeeded in improving Portugieser Blau by selection because it is a comparatively new variety and has not had time to differentiate sufficiently to offer suitable material for selection. *Locational factors.* These may permanently or temporarily mark the high cropping capacity shown by one clone. The soil may become vine sick. In such cases disinfection with  $CS_2$  is found to restore the soil to a healthy biological condition. *Mutations.* In vines the mutations which do occur normally persist, but selection may fail by reason of faulty budding or grafting or of incompatibility with rootstock. *Cultural treatment and manuring.* A selected variety may require different manurial and cultural treatment including pruning to uphold and allow its high cropping capacity to function. *Position of bud on shoot and type of shoot.* Opinions here are so conflicting that it must remain an open question whether any particular bud from any particular shoot is more likely to allow of success in selection than any other.

53. HUSFELD, B. 634.8-1.523-2.411  
 Ueber die Züchtung plasmoparawiderstandsfähiger Reben. (**Breeding vines  
 resistant to *Plasmopara*.**)  
*Gartenbauwissenschaft*, 1932, 7 : 15-92, bibl. 129.

This is an account of one phase of the important vine breeding work which has for some years been in progress under the direction of the Kaiser Wilhelm Institute at Müncheberg, Germany. The history of previous work is first noted and it is pointed out that immunity to *Plasmopara* cannot be achieved by selfing or crossing European vine varieties, since none of them possess any factors giving immunity. The possibility then lies in crossing European and American varieties, and it is with such experiments that the present article deals. The documentation of previous work is very full, the macro- and microphotographs clear. The following notes are from the author's summary. An account is given of artificial infection with *Plasmopara* and of a successful method of enabling the fungus to live through the winter on green vine leaves. Previous experiments have not disclosed specialized biotypes of the types. A method is described for raising and testing the resistance of a very large number of seedlings with the maximum economy of time, money and space. Segregation phenomena occurring in the  $F_2$  generation of Mourvèdre  $\times$  Rupestris 1202 C and Gamay  $\times$  Riparia 595 O are described. In the determination of mildew susceptibility the carriage of the growing point, whether perpendicular or not, and the amount of branching were considered as inherited factors. A monohybrid cleavage was discovered in the inheritance of an intermediate, pale red autumn colouring in the Mourvèdre  $\times$  Rupestris 1202  $F_2$  generation. The chromosome complement of both American and European varieties has been determined as  $2N=38$ ; the  $F_2$  generation of such crosses shows, moreover, no chromosomal eccentricities. In cytological control tests two plants were found with a chromosome complement of  $2N=40$ . These originated from the selfing of a Moselle Riesling plant. Reaction is shown to attack of the mildew in resistant vines by the quick death of the cells or tissue attacked and by increased chlorophyll or anthocyanin formation in the surrounding cells. The mycelium of the fungus is noticeably weaker in the resistant than in the susceptible leaves. This fact is taken into account in searching for an explanation of immunity. The problem can only be solved by crossing suitable American and European varieties and raising as seedlings hundreds of thousands of the descendants.



54. MÖHRINGER, K. 634.8-1.541.11  
 Adaptationspflanzungen im Weinbau. (**Planting on American stocks to suit local conditions.**)  
*Gartenbauwissenschaft*, 1932, 7: 93-120.

This article, though dealing with the adaptation of particular vines, mainly Riesling types, by means of particular American rootstocks, to different localities in Germany, should be of interest to all vinegrowers or viticultural instructors faced with the problem of replanting their vineyards on American stocks by reason of the approach of *Phylloxera*; the details noted in the trial fields of each locality are: Place—elevation and slope—date of planting—size of plot—variety and rootstock—distance between plants and rows—general physical character of soil—chemical composition of soil, i.e. pH reaction, percentages of CaO, K<sub>2</sub>O and P<sub>2</sub>O<sub>5</sub> at the surface, at a depth of 40 cm. (approx. 16 in.) and at 100-120 cm. (39-47 in.)—growth and health of different grafted vines. From the data obtained it is possible to advise intending growers on planting up localities diverse in many respects. Summing up experience gained the author stresses the importance of the following considerations prior to planting: selection of vines true to type for planting material, the compatibility of stock and scion and compatibility of the combined plant with soil and environmental conditions. [Cases are found where the stock grows well in a certain environment only until worked with a scion.—Ed.] He considers that the chemical, physical and biological composition of the soil are all important, and that as regards the first the pH reaction is of much greater importance than the total lime content.

55. DANIEL, E. P., AND MUNSELL, H. E. 634.87: 577.16  
**The vitamin A, B, C, and G content of Concord grapes.**  
*J. Agr. Res.*, 1932, 45: 445-8, bibl. 7.

In the authors' previous tests of vitamin content in Sultanina and Malaga grapes (*ibidem* 44: 59 and *H.A.*, 1932, 2: 3: 267) the skins were retained when making the tests, but in this later experiment only the flesh of the grapes after removal of skins was tested. The presence of very small amounts of vitamin A and of barely detectable amounts of vitamin B was discovered in the Concord grape flesh. There was no evidence of the presence of vitamins C or G.

56. GUZZINI, D. 634.87  
 La produzione e l'esportazione delle uve da tavola nell'ultimo triennio.  
 (**Production and exports of table grapes in the last three years.**)  
*L'Italia Agricola*, 1932, 69: 1018-27.

A review from the economic standpoint of table grape exports from Italy and the competition which they have to meet in the German markets, to which the grapes are chiefly consigned, from foreign European rivals.

57. LAGATU, H., AND MAUME, L. 634.8-1.83  
 Un cas d'absolue nécessité d'engrais potassique. (**The necessity for potash in the vineyard.**)  
*Prog. agr. et. vit.*, 1932, 49: 576-81.

Experiments were carried out in 1929, 1930 and 1931 on Aramon vines worked on Rupestris. Five plots of 400 vines each received the following different treatments: (2)\* nil; (7) 89 lbs. N per acre† as Chile nitrate and 89 lbs. P<sub>2</sub>O<sub>5</sub> as basic phosphate per year; (1) as in (7) + 106.8 lbs. K<sub>2</sub>O in 1929, and in 1930 and 1931 + 178 lbs. K<sub>2</sub>O, all as KCl; (C) Moderate manuring with guano containing 2% of K<sub>2</sub>O + 267 lbs. K<sub>2</sub>O yearly; (E) same as (C) but with 534 lbs. K<sub>2</sub>O instead of 267 lbs.

In plots 2 and 7 the following symptoms occurred: (1) leaf scorch, increasing steadily in severity, (2) stunting of shoots, (3) increased yellowing of leaves, (4) retarded and incomplete ripening of grapes. In plot 1 a certain number of slightly scorched leaves were to be seen, but no yellowing

\* Plots were designated 2, 7, 1, C and E.

† Amounts are actually given in kgs. per hectare.

occurred in 1931. In plot C scorching was very rare, growth generally was good. Plot E showed perfectly healthy plants cropping excellently. The authors draw the following deductions: On a calcareous loam soil in the presence of adequate water a vine will at first remove the immediately available potash from the soil and afterwards that which is less readily available, after which unless provided with additional potash its leaves will become scorched and its growth arrested. The addition of large amounts of potash are then necessary, initially to replenish the potash deficiencies caused in the soil, and only then to supply the plant with adequate quantities of this nutrient. It is suggested that, if really bad scorching is seen, it may take two or three years' applications at the rate of 534 lbs.  $K_2O$  per acre to restore equilibrium before a general routine application of 178 lbs.  $K_2O$  can be adopted.

58. MANUEL, H. L. 634.8-2.952

**Bordeaux spray versus dusting powders for the control of vine diseases.**

*Agr. Gaz. New South Wales*, 1932: 43: 848-50.

Trials conducted in 1930-31 and 1931-32 to compare the efficiency of copper-containing dusts and bordeaux mixture spray confirm those of previous years and are now terminated. The vines treated were Gordo Blanco, Black Hamburg and Black Muscat, 198 vines in each plot with an untreated control of 20. As Gordo Blanco alone developed disease the findings are concerned with that variety only. The net weights harvested were: A. Bordeaux mixture as required, 1,635 lbs., percentage waste 12.3. B. Copper-containing dust as required, 556 lbs., percentage of waste 41.7. C. Bordeaux mixture (14th October, 1931) plus dusting as required, 824 lbs., percentage waste 32.1. In A. waste was mainly through scalded or bird pecked berries, with very little disease showing. In B. waste was due to shrivelling and black spot in the bunches; there was partial defoliation due to black spot and dust injury. C. As in B. but to a less degree. Untreated vines developed downy mildew but only slightly. It is considered from these tests, which were carried out at Hawkesbury College, that dusting is not a control for black spot and causes serious damage to fruit and foliage.

59. HAMOND, JOYCE B. 634.51(42)

**Walnut growing in England.**

*Reprint from Country Life*, Nov. 19th, 1932, pp. 3.

The writer in a popular article describes the previous neglect of walnut culture in England and shows how some 4 years ago search was instituted primarily for varieties producing good eating nuts, but also for varieties which produced small clusters of nutlets suitable for pickling and lastly varieties possessing the burred wood dear to the furniture dealer. Selection was made of the best procurable both in this country and abroad and the selected varieties were then perpetuated by vegetative propagation, which has been very successful under glass.

## VEGETABLE GROWING.

60. HUDSON, E. C. 631.544

**Commercial horticulture in Hertfordshire.**

*Horticultural Education Association Year Book for 1932*, 1: 53-61.

The author gives an interesting account of the predominating feature of horticulture in the county, i.e. The Lea Valley glasshouse industry. He traces its origin from 1880 to the present day, noting that approximate present day acreage and estimated yearly production figures are as follows: tomatoes 875 a. yielding 35,000 tons, cucumbers 275 a. and 15,000 tons, grapes 75 a. with 5 million bunches, 75 acres of roses and 100 acres miscellaneous, including ferns and palms. He stresses several points to which particular attention is paid in the construction of houses, such as purity and freedom from air bubbles of glass used, supply of water etc. Tubular boilers are usual and although not so efficient as sectional boilers they can be easily and quickly repaired.

A new type of great promise has just been introduced. Estimated costs of erection of tomato houses and a specimen table of expenditure and receipts are given.

The process of tomato growing is described. The chief varieties or strains grown are Ailsa Craig, Klondine Red, Blaby, Potentate and E(xperiment) S(tation) No. 1, being a cross between Ailsa Craig and Blaby. Of cucumbers Butcher's Disease Resister is the commonest. Gros Colmar, Black Hamburgh and Muscat of Alexandria are the most commonly grown grapes.

The main rose varieties grown for forcing are Madame Butterfly, Lady Sylvia, and Golden Ophelia. Carnations are an important crop despite a most serious *Fusarium* stem rot. Palms and ferns are grown in some nurseries as well as many other less important crops. The growing of winter lettuces and mushrooms shows promise of early extension.

61. BEWLEY, W. F.

631.544

**Some recent developments in relation to glasshouse crops.**

*Horticultural Education Association Year Book for 1932, 1: 23-6, bibl. 11.*

The author describes different treatments which have been given at different times in the attempt to induce or restore glasshouse soils to their initial fertility which is normally lost after the first few years.

The application of fresh cut grass at the rate of 30 tons per acre in December and January has been found extremely efficacious. There is, however, a danger of the introduction of disease, while the provision of a large amount of fresh cut grass at that time of the year presents considerable difficulty. Again trials have been made of growing different grasses and legumes and turning them in. The best results have been got with horse beans and barley, but have been insufficient. The application in winter of grass cut and stacked in the summer has been unsuccessful owing to the bad condition of the grass caused by fermentation. Hay has been applied but without any increase in crop. On heavy and medium soils, where the land has previously been heavily manured for some years, it has been found that the nitrogenous soil constituents are often active plant poisons. These may equally well exist in glasshouse soils. The addition of straw to such soils is found to increase bacteriological activity and so cause a breakdown in these constituents. Such additions have been made successfully to glasshouse soils. The author in fact advises a trial of straw. Wheat or oat straw, length 18-24" should be applied at the rate of 3 tons per acre to both the top and second spits. It should be placed almost vertically, bastard trenching being the best method of effecting this. Plentiful water should be applied afterwards. The effect is found to be somewhat similar to that after soil sterilization.

Soil sterilization has hitherto had good results, though without restoring the initial fertility, while owing to risk of bad contamination the addition of organic residues after sterilization has not been generally recommended. Root development is, however, largely dependent on the physical conditions in the soil and experiments have shown that the addition of carefully chosen organic matter to sterilized plots may be extremely successful. The value of soil heating is noted and various methods discussed. Electrical cables have hitherto proved too expensive. A trial made with  $\frac{1}{2}$ " hot water pipes placed 15" below the surface and 12" apart, the water being circulated by an electric pump, has given good results at a lower cost than electric cables. The future seems to rest with this or a steam heating method.

The author stresses the importance of thermostatically controlled heating of greenhouses, whether oil or anthracite is used. As regards spraying he notes that the use of salicylanilide with Agral 1 as a spreader has given excellent results. He mentions the advisability of the use of such catch crops as lettuce.

62. BOYES, D.

635.1/6-1.521

**Plant breeding at the Cambridge Horticultural Research Station.**

*Horticultural Education Association Year Book for 1932, 1: 27-36.*

This station, the aims of which are here detailed, is concerned mainly with vegetable crops. It has hitherto concentrated its chief attention on brussels sprouts, cauliflower, broccoli, peas and strawberries. Briefly it tries to combine selection with a commonsense application of the Mendelian method in the production of vegetable stocks which are (1) uniform in type, (2) suitable



for particular conditions of soil and climate, (3) in line with market needs. The writer describes at length the method used in the improvement of brussels sprouts, which illustrates also that used in the case of cauliflowers and cabbages. Details are given of the following stages in the work : (1) preliminary examination of commercial varieties, (2) testing of commercial varieties, (3) selection therefrom of plants with one or two desirable characters, (4) selfing and crossing selected plants, (5) maintenance of stocks of own material, (6) building up by crossing and selection strains firm for certain desirable characters. Further work will consist of improving stocks already raised, producing seed for distribution and possibly investigation of the genetics of such points as hardiness, earliness and solidity of sprouts. Hitherto canning beans have come almost entirely from abroad owing to the fact that the varieties in question will not normally ripen their seeds here. The so-called varieties have been sown and found to consist of a collection of individuals, among which the Cambridge station has found some which are satisfactory both for seed development here and for canning. Thus the first step has been taken towards making the commercial growth of such beans in this country possible.

63. VOGEL, F. 631.85 : 634.72 + 635  
 Ueber Wirkung und Wert der Phosphorsäure im Superphosphat, Rhenianaphosphat und Thomasmehl bei Gemüse, Sommerblumen, Stauden, Obst- und Ziersträuchern und bei Topfpflanzen. (**The effect and value of the phosphoric acid in superphosphate, Rhenania phosphate and basic slag on vegetables, flowers, shrubs, small fruits, ornamentals and pot plants.**)  
*Gartenbauwissenschaft*, 7 : 202-82, bibl. 25.

For the pot plants only ordinary potting soil and pots were used, but for the remainder a phosphate-poor mixture of peat soil (Niedermoorerde) and quartz sand was used in special cement pots. The author gives an account of the different phosphorus deficiency symptoms in each plant and shows the effects of adding different phosphatic fertilizers. Phosphorus deficiency was shown not only in decreased production but in many definite outward characteristics such as rigidity and toughness of leaf, unusual pose of leaf, lack of colour in flowers, anthocyanin formation in leaves, increased or decreased chlorophyll. The author notes that in a mineral soil deficient in phosphates deficiency symptoms would certainly be quite different.

The total plant substance produced in the cement pots which received NK as basic manuring but no phosphate varied from 3% to 60% of that produced in the presence of phosphate. The plants which were particularly severely affected in this respect were lettuce, *Phlox decussata*, kidney beans, hydrangea, parsley, *Aster chinensis* and beetroot, while tomato, rose, radish, dahlias and endive produced well in the absence of phosphates. The pot plants, chrysanthemums, pelargoniums and fuchsias grown in ordinary potting soil, showed very little improvement in quantity or quality in consequence of the addition of phosphate.

As regards the three fertilizers considerable difference in effect was observed especially in the early stages of growth. Germination and first growth were in most cases very favourably influenced by superphosphate, only slightly less so by Rhenania phosphate and very little by basic slag. At the highest point of growth superphosphate was again the most successful. The effect of Rhenania phosphate was again second, approximating more closely to that of superphosphate than to that of basic slag, which at this period was definitely inferior, though effects tended to level out in the case of plants with a longer growth period. Although as regards quality in some cases the basic slag appeared to have some advantage, on the whole the order of value given above stands proved. Only in very few cases were the results of adding any of the phosphates not significant. Those obtained with the Rhenania phosphate agree with results on other crops previously reported. Its phosphoric acid comes more easily into solution and can so be more easily assimilated by the plant than that of basic slag. That its effect is peculiarly independent of soil reaction gives to Rhenania phosphate in the author's opinion a wider, if sometimes a less intensive, sphere of usefulness than superphosphate in horticulture. Other plants not mentioned above which formed part of the experimental material were spinach, onions, leeks, *Calendula*, red currants. The conclusions reached are backed by numerous tables and figures.

64. ARTHUR, J. M. 631.544 : 631.588.2

**Artificial light and plant growth.**

*Boyce Thompson Inst. prof. paper*, Vol. 1, No. 22, 1932, pp. 212-21, being reprinted from *Agricultural Engineering*, 1932, 13 : 288-91.

This article stresses the necessity for care in the use of artificial light and the danger of using ultra-violet rays beyond the limit of sunlight. The author discusses the different regions of the solar spectrum and the effect of ultra-violet at the one end and of the infra-red rays at the other on plant growth. He quotes experimental data to show the effects of using different types of lamp of different intensity mainly on growth and dry weight increase. He further notes that much lower intensities may be sufficient to influence flowering appreciably. Thus snapdragon, rose, sweet pea and phlox can be brought into flower rapidly on day lengths of 15 to 18 hours by the use of artificial light at intensities of 800 to 1,000 ft.c. (foot candles) as a supplement to sunlight.

65. RODENBURG, J. W. M. 631.588.2 : 631.544  
Kunstlichtcultuur II. (Cultivation of plants in artificial light.) [German summary.]

*Med. Lab. Tuinbouwplantenteelt, Wageningen*, 17, 1932, pp. 37, bibl. 2.

The author's previous article on the subject, being *Med.* 14, was very briefly reviewed in *H.A.*, 1931, 1 : 1 : 3. His later investigations have mainly concerned the ideal intensity of neon light for practical use. During 1930-31 he tried the effect of various light intensities on the following plants among others : cucumbers, tomatoes, cinerarias, gloxinias, lathyrus, Star of Bethlehem. In all cases earlier blooming and cropping resulted. The author is led by his experiments to conclude that when artificial lighting is given for 8 hours a day to most greenhouse plants, at least 500 candle neon light must be used. With a less intensity results can hardly be expected. Increasing the candle power above 500 has a rapid and favourable effect as for instance on young cucumber plants. An important point for flower growing is that neon radiation may encourage not only leaf growth but also amount of blossom, as in Star of Bethlehem and gloxinias.

66. ANON. 635.64-1.588.1  
**Tomatoes and electricity.**

*Rural Electrification*, 1933, 8 : 236.

The installation consisted of a 50 yd. length of Magnet electric soil heating cable laid in 4 rows 4 inches apart at a depth of 8 inches to provide additional bottom heat, on one side of a heated greenhouse, at Preston, Lancs. The other side was used as a control. The electric current was turned on at night only, from 10.30 p.m. till 9 a.m. The heated soil registered a temperature of 74°F., the unheated 52°F. The tomato plants were put in in February. The current was discontinued after 4 weeks, having consumed 196 units of electricity. During the day the drop in soil temperature after switching off the current was 3-4°F. In the result the electrically heated plants were ready a month earlier than the controls and the fruit fetched a much higher price. The lower trusses also set better. It is stated that in future 3 rows only of cable are to be used, for 21 nights, and only after watering.

67. LOSCHAKOWA, N., AND OTHERS. 635.64-1.588.2  
Ist künstliche Beleuchtung bei Tomaten wirtschaftlich ? (The economic aspect of artificial light for tomatoes.)  
*Obst. u. Gemüsebau*, 1932, 78 : 169-70.

An account of preliminary investigations made at the Kaiser Wilhelm Institute, Müncheberg. Owing to the use of apparatus already available the actual energy used was admittedly excessive. A 5,000 candle power, 1,000 watt lamp was used to give light to young tomato plants sown on January 13th so that the total light hours including daylight amounted to 15 hours. An equal number of plants were treated otherwise similarly but without additional lighting. The lighted plants blossomed on the average 24 days before the unlighted. On April 4th all the plants were removed from the greenhouse to a house which received very little heating, and here they were

subjected to 230 candle power lighting till the end of the month, always being certain of a total light period of 15 hours. The weather was particularly cold between April 5th and May 13th, the average temperature in the house at 6 a.m. being only about 47·66°F. Consequently growth came temporarily to a standstill. Two varieties were used, namely Danische Export and Bonner Beste, and it was possible to start picking the former on June 4th and the latter on June 6th (lighted plants) but not till June 25th in both cases where no lighting had been used. The actual weights harvested from treated and untreated plants were much the same, but the prices received for the early tomatoes were very much more than for the late ones. The authors suggest that comparable experiments should be made on a commercial scale and suggest that the following arrangements should be observed: light sources 70-80 cm. above the plants—distance between light sources 1·5-2 m. A 200 watt lamp for a surface of 1·5-2 qm. will then give a light of about 500 candle power at the smaller figures mentioned or of 800 candle power at the higher figures. They note that 15 hours light should be ensured to the plant. They stress the necessity for no moisture being present on the plant leaves during artificial lighting or burning may occur.

68. VON SENGBUSCH, R., AND OTHER. 635.64-1.523-2.48  
 Immunitätszüchtung bei Tomaten. (Breeding for immunity to *Cladosporium fulvum* on tomatoes.)  
*Züchter*, 1932, 4: 257-64, bibl. 60.

The authors, describing recent work at the Kaiser Wilhelm Institute at Müncheberg, Germany, give notes on the following:—1. Methods of infection, 2. testing seedlings, 3. testing in the open field, 4. testing cuttings, 5. testing cultivated and wild forms, 6. testing the  $F_1$ ,  $F_2$  and  $F_3$  generations of the crosses *Solanum racemigerum* Lange  $\times$  cultivated varieties, 7. breeding results, 8. crossing with Stirling Castle. They summarize as follows:—*S. racemigerum* is immune to the forms of *Cladosporium fulvum* occurring at Müncheberg in 1932. The results of the  $F_1$ ,  $F_2$  and  $F_3$  generations arising from crosses of *S. racemigerum* and *S. lycopersicum* (susceptible varieties) make it very probable that immunity is conditioned by a dominant factor. It will be possible to raise large-fruited tomatoes from these crosses. Stirling Castle is resistant but not immune to *C. fulvum*. The behaviour of the  $F_1$  generation allows of the conclusion that resistance in Stirling Castle depends on recessive factors.

69. NIGHTINGALE, G. T. 635.64-1.811.7  
 Effects of sulphur deficiency on metabolism in tomato.  
*Plant Physiology*, 1932, 7: 565-95, bibl. 48.

Details are given of the exact methods used and tests applied. The tomatoes were of the variety Marglobe and were grown in sifted loam soil in individual 4 inch pots. Initially, from 2,500 plants available 1,200 were selected for uniformity, 200 of these being used for initial analysis and the remaining 1,000 transplanted for experimental treatments to washed quartz sand in new 10 inch clay pots. They were then subjected to nutrient treatments, which may be described as the complete or plus-sulphur solution, the minus-sulphur and the minus-nitrogen solution. They were grown under glass and under conditions of temperature and humidity suitable for commercial tomato production. The effects on metabolism and on the general growth of the plant are set out in detail. It may be noted that the general appearance of sulphur-deficient plants was that of plants gradually but not completely deprived of nitrogen. The lower leaves were yellowish green, the stems hard and woody. Both roots and stems were of very small diameter, but a remarkable capacity for elongation was shown by the stems, their length equalling that of the complete nutrient plants.

70. SAYWELL, L. G., AND ROBERTSON, D. P. 635.64: 581.192  
 Carbohydrate content of tomato fruit.  
*Plant Physiology*, 1932, 7: 705-10, bibl. 16.

The authors describe their method of investigation. They summarize as follows: The sucrose content of California tomatoes varied from very small quantities up to 0·05 per cent; the dextrose content was about 1·2 times the levulose content. The starch content varied from



0.01 to 0.06 per cent, while the acid-hydrolysable material varied from 0.10 to 0.30 per cent. The total solids content ranged from 6.5 to 7.0 per cent on the average. All results are expressed on the basis of the fresh weight of the fruit.

71. REINHOLD, J. 635.63-1.588.2  
Ist künstliche Belichtung zur Treibgurkenkultur wirtschaftlich? (**The economic aspect of artificial light for cucumbers grown under glass.**)  
*Obst u. Gemüsebau*, 1932, 78: 182-3.

Seedlings were planted in 7 cm. pots in mid-December and received 8 hours' artificial light from 200 watt lamps in addition to the daylight available for some 40 days. It was found that 11 lamps sufficed for 280 plants. The results were much the same as in the case of tomato plants mentioned in a previous article (see 67 above). In this case again the crop was not appreciably increased, but it was ready to market earlier and was of excellent quality. In the writer's opinion import duties would appear to make artificial lighting of cucumbers a paying proposition in Germany. [The low cost of electric current is also a factor.—Ed.]

72. HABER, E. S. 635.61-1.55  
**Effect of size of crown and length of cutting season on yields of asparagus.**  
*J. Agr. Res.*, 1932, 45: 101-9, bibl. 10.

One-year-old crowns were planted out in 1927 and observations made in 1929, 1930, 1931. The author notes that his results confirm those of several other workers in showing that male crowns produce more spears and a heavier yield per plant than female crowns and that female crowns produce spears of larger diameter. Under his conditions significant correlations were found to exist in male asparagus plants between the weight of 1-year-old crowns when planted and the number of spears and total weight of spears produced during the first three cutting seasons. The 3 years' data show an increase in weight and number of spears for all rows irrespective of length of cutting season except rows in which the cutting season was extended each year until July 15th. The author discusses indications as to the optimum time of cutting afforded by his data.

73. JONES, H. A. 635.61-1.55  
**Effect of extending the cutting season on the yield of asparagus.**  
*Univ. Calif. Coll. Agr., Agr. Exp. Sta. bull.* 535, 1932, pp. 15.

The tests with the Palmetto variety began in 1924 and will probably continue another 6 or 7 years. In this bulletin observations are made on the effects noted in the first 7 years of extending the cutting season by a fortnight on the production of spears, differentiating between male and female plants, and on the production of stalks.

74. DUSTAN, A. G. 635.1/6-2.7  
**Vegetable insects and their control.**  
*Dom. Canada Dept. Agr. bull.* 161 (new series), 1932, pp. 74.

This bulletin deals with insecticides in general. A particular comparison is made of arsenate of lead, arsenate of lime and Paris green, while consideration is given to the merits of dusting and spraying and the effects of cultural treatments on insect control. General control methods are suggested for dealing with aphids and flea beetles. As regards flea beetles, spraying with Bordeaux to drive them elsewhere is the suggestion. A section is devoted to general feeders and others to insects attacking the following plants: asparagus, beans, beets and spinach, cabbages, etc., carrots, parsnips, celery, maize, cucumbers and melons, onions, peas, potatoes, tomatoes and egg plants.

75. MOTTE, J. 635.2  
**Le Konnyaku du Japon. (The Konnyaku of Japan.)**  
*Ann. Musée Colonial de Marseille*, 1932, Ser. 4, 10: 3: 1-22, bibl. 7.

The konnyaku of Japan is *Amorphophallus Rivieri* Dur. var. *Konjac*. In Japan the flour of its tuberous root is largely used instead of rice, since of this latter commodity Japan is unable to

grow enough for her needs. Konnyaku has this advantage over rice that it can be grown in conjunction with other crops such as mulberries without interference with them. New plantations are started with tubers 2 to 4 years of age set out in April in well manured ground. Harvest is in mid-October. The smaller tubers are then stored under cover for replanting in spring and the larger ones are sent to the markets. A description is given of methods of preparing the flour. Other products made from *Amorphophallus Rivieri* are a gum used in paper manufacture and for "dressing" silk, cotton or wool fabrics and for getting up cotton thread to resemble flax or hemp. A kind of glaze is also made which is used in waterproofing paper or fabric. The chemical composition of the flour enables it to be used as a substitute for cellulose in photography and in the manufacture of explosives.

The following are also noted:—

PEARSON, O. H., AND PORTER, D. R. **Tomato production in California.** *Calif. Agr. Ext. Serv. circ.* **66**, 1932, pp. 57.

PEARSON, O. H. **Breeding plants of the cabbage group.** *Univ. Calif. Coll. Agr., Agr. Exp. Sta. bull.* **532**, 1932, pp. 22, bibl. 11.

HAWTHORN, L. R. **Spinach under irrigation in Texas.** *Texas Agr. Exp. Sta. circ.* **66**, 1932, pp. 11, bibl. 6.

HORSFALL, J. G. **Red oxide of copper as a dust fungicide for combating damping-off by seed treatment** [especially vegetables.—ED.]. *New York State Agr. Exp. Sta. Geneva, bull.* **615**, 1932, pp. 10, bibl. 14.

## FLOWER GROWING.

76. VOÑ VEH, R. 635.9-1.535  
Experimenteller Beitrag zur Frage nach der Polarität der Costus-Sprosse.  
(An experimental contribution to the problem of polarity in *Costus* shoots.)  
*Gartenbauwissenschaft*, 1933, **7**: 293-307, bibl. 8.

This is an account of experiments carried out at the Botanical Institute, Nymphenburg, in 1930. The author considers that the results, which are discussed in detail with clear illustrations, may be turned to the following practical use in the garden. Plants belonging to the *Costoideae* which are difficult to propagate from seed can be successfully propagated as follows. The shoots are cut into lengths containing 3-4 internodes and are set horizontally in sand in warm, moist propagating boxes. In 3-4 months a rooted and leafed plant will be found to have formed from each piece. These plants arising from the nodes can then be readily separated and planted out. If it is desired to further the development of the underground rhizome, the topmost bud of the strong aerial shoot should be removed.

77. FUKUDA, Y. 589.124:581.185  
**Hygonastic curling and uncurling movement of the leaves of *Rhododendron micranthum* Turcz. with respect to temperature and resistance to cold.**  
*Jap. J. Bot.*, 1932, **6**: 191-224, bibl. 17.

A critical, illustrated examination of the processes which may be observed during the curling operation under particular circumstances together with a discussion of its causes and significance.

78. NAGAHARU, U. 635.974.8:575.2  
**On the reappearance of haploid in the Japanese Morning Glory.** (*Ipomoea* spp.)  
*Jap. J. Bot.*, 1932, **6**: 225-43, bibl. 18.

The reappearance occurred in the  $F_1$  generation of the varietal cross, Normal  $\times$  Pine Inconstant. A description is given of the haploid, of its scions grafted on *Ipomoea edulis*, of a mutation noted in one shoot, and of the cytology of the haploid.

79. BOIS, E. J. 635.944  
La culture forcée du glaïeul. (**Forcing the gladiolus.**)  
*Rev. Horticole Suisse*, 1932, 5 : 275-6.

Autumn flowering gladioli were forced into bloom by the end of June. The corms were potted in February singly in home made pots consisting of compressed earth and manure. These pots are easily made by a very simple apparatus (*ibidem* 1933, 6 : 8). After potting the corms are stood in frames until the end of March when the greenhouses should be empty of azaleas or other plants. The earth pots containing the bulbs are then planted in the greenhouse beds without further disturbance. The only other requirements are the application of a little heat when the weather is cold, abundant air at all times and the usual attention to watering. Grown thus every corm is said to have produced a flower spike. Only well ripened corms should be used. Some varieties suitable for forcing are Rubini, Wilbrink, Halley, Brenchleyensis, Maréchal Foch, Odin.

80. LUYTEN, I., AND OTHERS. 635.944 : 581.145.1  
De optimale temperatuur van bloemaanleg tot bloei voor *Hyacinthus orientalis*. (**The optimal temperatures from flower formation to flowering for *H. orientalis*.**) [English summary 8 pp.]  
*Lab. Pflanzenphysiologisch Onderzoek, Wageningen, Med.* 36, 1932, pp. 64, bibl. 14.

An account of experiments which started in 1922. The authors note the common methods recommended by Dames and Nyssen for inducing early flowering in bulbs, which are specially prepared during the summer months, part of the process being to lift them when in full leaf in early June. This paper aims at describing a method by which bulbs allowed to dry off naturally in the field can also be had in flower at Christmas. The variety used was *L'Innocence*. The treatment appears to resolve itself into a question of optimal temperatures at given periods of development, which are here called *flower cluster formation* and *stretching*. For flower cluster formation the bulbs are held unplanted in a temperature of 34°C. for 5-10 days and subsequently in a temperature of 25.5°C. for 5-6 weeks, then for three weeks at 17°C. This concludes the flower cluster formation period. The stretching period now begins. For this the bulbs are planted in boxes and transferred to a constant 13°C. [presumably in the dark.—ED.] where they remain until the majority of noses have reached a length of 4 cm. They are then brought into the light in a greenhouse heated to 22.5°C. and given ordinary greenhouse treatment. Removal before 4 cm. in length leads to bad flowering, while leaving after the attainment of this length retards flowering. When the flower cluster has outgrown the leaves the temperature is reduced to 15°-17°C. The bulbs should be in bloom in 162 days from the beginning of the treatment.

The following are also noted :—

- COOK, H. H. **The cultivation of violets.** *J. Roy. Hort. Soc.*, 1933, 58 : 115-24.  
STEVENSON, T. **Early flowering chrysanthemums.** *J. Roy. Hort. Soc.*, 1933, 58 : 94-102.  
MCWHORTER, F. P., AND WEISS, F. **Diseases of narcissus.** *Oregon Sta. Agr. Coll., Agr. Exp. Sta. bull.* 304, 1932, pp. 41.  
GREEN, D. E. **A lupin disease due to *Ceratophorum setosum* Kirchner, a fungus new to Great Britain.** (Being contributions from the Wisley Laboratory LXVII.) *J. Roy. Hort. Soc.*, 1933, 58 : 144-5.

#### CITRUS AND SUB-TROPICAL FRUITS.

81. HENRICKSON, H. C. 634.3 : 581.11  
**Some citrus problems. Absorption and movement of plant nutrients.**  
*Porto Rico Agr. Exp. Sta., Mayaguez. Agr. Notes*, 60 (stencil), pp. 3.

*Feeding Roots.* The soil was removed from large non-fibrous roots of citrus trees. Sheets of paraffined paper were placed underneath the exposed sections to prevent leaching or spreading



of the salts to be applied. The exposed roots were then covered with soil to which a small quantity of lithium nitrate had been added. The fact that lithium was subsequently found in the leaves of the treated trees is taken to prove that the lithium entered through the bark of the large roots. It is suggested that if lithium does so, probably nutrient salts can do so too and that therefore a tree is not entirely dependent on its fibrous roots for its food supply. *Movement of plant nutrients in the tree.* Lithium nitrate was applied to root areas at measured distances from the trunk. Subsequent examination of material from the tree suggested that the average movement through the tree, root, trunk and branch combined, was 12-13 ft. in 48 hours. Lithium was invariably found in leaves and branches 25-30 ft. from point of application 72 hours after application to the roots. It travelled, however, straight up the tree, none being found in the branches on the opposite side to the application, hence, it is stated, fertilizers applied to one side of a tree could not be expected to influence the other side. The exact absorption of lithium was not tested in citrus, but in sugar cane its absorption into the stalk and movement of 6-12 inches occupied 12 hours, while subsequent movement in the stalk was at the rate of 1-2 ft. per hour. The time taken before the elements are metabolized varies with the state of the tree, but from observations made on the application of fertilizer and irrigation water to wilted trees it is stated that irrigation water reached the top of the tree in 10 hours, caused expansion of new leaves and buds in 5-7 days, and in 10 days unfertilized trees were shedding more blossom than fertilized. The metabolism must, therefore, have occurred within 10 days.

82. FAWCETT, H. S. 634.3(072) (45)  
**Citrus experiment station in Sicily.**  
*California Citrograph*, 1932, 18 : 36, 55.

A description of this station at Acireale is given by the author who spent two months there studying citrus diseases in 1930. The principal subjects in which the station is interested according to an annual report are: (1) the collection and comparative study of citrus varieties, (2) fertilizing, pruning, hybridizing experiments, (3) disease prevention and cure, (4) packing and handling, (5) establishing a variety planting of recommended varieties for supply of budwood, (6) chemical analysis and research into the constitution of citrus, (7) physiological research, (8) publication of information on citrus. In addition work on other fruit such as figs, olives, peaches, etc., is also carried out.

83. CLARK POWELL, H. 634.3-1.55  
**The continuity of high and low yielding tendencies in citrus trees.**  
*J. Pom. Hort. Sci.*, 1932, 10 : 295-300.

This is an account of observations on a number of fertilizer plots laid down in several bearing groves in the Sundays River Valley, Eastern Cape Province, South Africa. The system of plot selection is based mainly on that followed at Riverside, California. The yield of individual orange trees observed establishes the existence of a high correlation between yields of the same trees in successive years. There is no evidence of any biennial bearing tendency.

84. PROVAN, J. L. 634.3-1.521  
**The elimination of undesirable types of citrus in Victoria.**  
*Stencilled copy of paper prepared for Conference of Citrus Growers*, Gosford, New South Wales, Jan. 17-19, 1933, pp. 3.

The paper deals with attempts, in progress and contemplated, to improve the standard of citrus fruit grown in Victoria. It is stated that an admixture of inferior types of tree is to be found in every grove and that the trouble is increasing. Investigations are to be made into the effect of climate, soil, rootstock and cultural treatment, and a 6 acre experiment orchard of Washington Navel and Late Valencia oranges on sweet and sour orange and rough lemon stocks is to be laid out, to include six replications, on a typical soil. Buds from high quality trees will also be worked on trees in other districts with different climate and soil conditions. It is pointed out that growers are prone to consider that to secure a high yield they have merely to re-work an unsatisfactory tree with buds from a prolific variety. This, the author remarks, is far from being the

case and in many cases, estimated at 80% in California, the low yield is due to environmental conditions and therefore could not be improved by top working. Top working, however, effects improvements in orchards containing rogues, inferior varieties, or hereditarily low producers. Discussing the possibilities of bud mutation the author declares that there is no known example of bud mutation in yield alone, though it is known in combination with other morphological characters as in Thompson's Improved Navel. The importance of bud selection lies, not so much in the possible production of an improved variety, as in the prevention of the dissemination of numerous inferior strains of good varieties and in the elimination of subsequent mutations within these varieties. [In a letter to this Bureau the author mentions that most of the top-working of citrus in Victoria is done by budding on to young growth induced by heavy pruning of the top of the tree, 100% success having been achieved in the last four experiments.—ED.]

85. STREET, E. A.

634.3 : 575.252

**Carefully chosen buds bring high citrus production.***California Citrograph*, 1932, 18 : 35, 56-8.

A description of an Arizona citrus grove, in which every tree has been raised from selected buds from a few selected high-yielding trees. Part of the original selections of grapefruit were made by a committee consisting of A. D. Shamel and other officers of the U.S. Dept. Agr., others were obtained from known high-yielding pedigree trees on a highly productive estate. It is stated that the production, uniformity and quality of the fruit is beyond anything hitherto accomplished and that each budded tree exactly reproduces the characters and individual peculiarities of its parent. The value of careful bud selection is emphasized.

86. UPHOF, J. C. TH.

634.3 : 581.145.1

Wissenschaftliche Beobachtungen und Versuche an Agrumen. IV. Der polygamische Zustand einiger Citrusarten. (**Scientific observations and experiments on citrus. IV. Polygamy in certain species.**)  
*Gartenbauwissenschaft*, 1932, 7 : 121-42, bibl. 4.

The author here discusses the incidence in certain citrus varieties and hybrids of polygamy, i.e. a condition in which hermaphrodite and unisexual (in this case male) flowers occur on the same, or on different individuals of the same species. After detailing the few and casual references to the subject in the more standard works on citrus he recounts his own observations. Of *C. Limonia* Osbeck he examined many commercial varieties, including Villafranca, Meyer's Chinese Lemon No. 11993A. Both in the latter as in the Sweet Lemon male flowers were found to be more numerous than hermaphrodite. In *C. aurantifolia* Swingle the number of male flowers found is not usually so great as in the case of *C. Limonia* above. In the "Mandarinenlimonelle" male flowers are very much the most numerous, the gynoeceum often being merely rudimentary. Rangpur Lime showed a large proportion of male blossoms. The *C. medica* L. or Citron group showed the largest proportion of male flowers of any citrus variety and every tree examined showed less than 50% hermaphrodite flowers. In no case did the author find male flowers in seedlings of the following varieties of the *C. sinensis* Osbeck group : Valencia Late, Parson Brown, Pineapple Homosassa and Lue-gim-gong. Similarly no male flowers were found in the varieties of *C. paradisi* Macf. examined including the Marsh Seedless. Among the tangerines (*C. nobilis* Lour. var. *deliciosa* Swingle) only Dancy was studied, and here with the exception of a single case noted on one tree no male flowers were found. The same was the case with the King Orange variety of *C. nobilis* Lour. and in Mandarines observed. *C. Aurantium*, however, shows an incidence of male flowers varying between 5% and 12%. Turning to hybrids a large number of male flowers were found in the Citrange (*C. sinensis* × *Poncirus trifoliata*). The Limelo (*C. aurantifolia* × *C. paradisi*) also disclosed numerous male flowers, the Limequat (*C. aurantifolia* × Kumquat) 1-10%. It is interesting to note that the Tangelo, which is a hybrid of *C. paradisi* and *C. nobilis* var. *deliciosa*, neither of which produce male flowers, shows the same habit as its parents. The same is observed in the Temple Orange, another hybrid of parents of this habit. This fact shows, in the author's opinion, that although the production of male flowers is partly dependent on nutrient conditions, the capacity for

producing such flowers is clearly a dominant genetic character in the  $F_1$  generation. In *Microcitrus australasica* male blossoms were much more numerous than hermaphrodite. Whether male flower production finally depends on nutrient conditions the author has so far been unable to determine. He describes various studies of the anatomy of rudimentary fruitbuds which revealed interesting facts but did not answer the question.

87. SHAMEL, A. D., AND POMEROY, C. S. 634.3-1.542.24  
**Performance of girdled and not girdled navel orange trees.**  
*California Citrograph*, 1932, 18 : 38, 62.

The experiments were begun in 1928 on 30-year-old trees in excellent physical condition and producing typical fruits, growing at Corona, California. The object was to discover the influence of ringing on the commercial quality of the crop and to discover whether continued girdling over a period of years reduces the vigour and growth of the trees. The method of ringing is to make a clean cut entirely round the tree trunk through the bark to the wood. A strap fastened round the trunk is used as a guide to the knife. The first point of ringing is 6 inches below the crotch of the trees, cuts in succeeding years being made an inch below the preceding one. The season for ringing is when the flowers are in full bloom and the petals have begun to drop. So far little effect has been observed from the use of ringing except in the light year 1930, when the ringed trees bore a heavier crop than the unringed, this effect being noticed also on other estates where ringing is practised. The most noticeable effect so far is the marked reduction in yield of previously ringed trees that occurs the season after ringing has been omitted. So far effect on quality or size of fruit is not significant.

88. MARLOTH, R. H. 634.3-1.542.24  
**Girdling citrus trees.**  
*Farming in South Africa*, 1931, 6 : 233-4 and 1932, 7 : 261, 263.

A progress report of experiments in the ringing of citrus trees laid out at White River, Eastern Transvaal, consisting of—No. 1, 327 Washington Navels 9 years old in 1930 and very uniform and No. 2, 527 Washington Navels 8 years old in 1930, presenting considerable variation in size and vigour. Results to date indicate that ringing, i.e. a single circular cut knee high round the trunk through the bark to the wood, just before the last petals of the main bloom have dropped, gives a substantial increase over yields obtained from girdling at blossom breaking, full bloom, or fruit pea size. Increase of girdled trees over controls in the first year was 12%, while re-girdled the following year they gave a 4% increase or a total of 16% for the two years. Trees girdled in 1930 and not re-girdled in 1931 gave a 3% increase over the controls making a total of 15% increase for trees girdled one year and left the next. Instances are given from other orchards to show that ringing has led to substantial increases of yield, in one case almost trebling that of the controls. It is pointed out that these enormous increases have occurred only when low yielding or shy bearing trees have been girdled. When trees in good health and bearing have been ringed, as noted above in the first paragraph, the increase has not exceeded 12% for the first year.

89. OPPENHEIM, J. D. 634.31 : 581.192  
**Preliminary note on the evaporation of Jaffa oranges.**  
*Hadar*, 1933, 6 : 3-4.

Dryness in Jaffa oranges is due to a dissimilative process whereby the plant draws on the moisture content of the fruit for its own uses. This process can occur when the fruit is left too long on the tree or, if weather conditions, such as deficiency of winter rainfall, cause an early ripening, it can begin long before picking. Dry winds in autumn, though less hot than the spring "Khamsins," have a more detrimental effect in years of drought. It is more important to irrigate trees when they require it rather than at fixed periods as is shown by the drying up of the fruit of just those trees which, although heavily irrigated in summer, have not been watered since. The picked fruit is also influenced by its own evaporation, but that evaporation is not influenced by the thickness of the skin is apparent from trials with weighed Jaffa oranges sent from Palestine



to the Division of Horticultural Breeding at Wageningen, Holland. These were stored and reweighed at fortnightly intervals, but no correlation could be traced between thickness of skin and loss of moisture.

90. REICHERT, I., AND HELLINGER, E. 634.3-2.1/7  
**Blemishes and their influence on the keeping quality of oranges.\***  
*Hadar*, 1932, 5 : 287-92, bibl. 5.

The incidence of seven orange fruit blemishes common in Palestine was observed in fruits from three different sets of spraying experiments. With the exception of thrips injury the other blemishes are all such as are found on oranges from other countries. It is stated that about 70% of all the fruit grown in Palestine citrus orchards is affected by various blemishes which prevent it from being included under the quality known as first brand. The blemishes and the percentage of fruit injured by them in the three groves recorded are: (1) Silver scurf, 30%. The affected fruit showed good storage quality however, the wastage being 0.6% only. (2) Wind wounds, with an average in all 3 groves of 28%, the two sheltered groves having 17.8% and 19.7% of injury respectively, while the exposed grove had 47.4%. The keeping quality was not good, showing an average wastage of 8.6%. (3) *Fumago* or sooty mould showed great variation in the different groves, the average being 9.9%. The wastage was only 1.1%. (4) Thrips markings averaged 10.1%, the wastage being 2.4%. (5) Farooosh or puffing is a blemish said to be caused by irregularities of growth in the rind due to intermittent periods of drought and rain. The rind becomes puffy and soft and cracks readily under pressure. The average was 3.7%. Keeping quality was very poor, the wastage of blemished fruits being 20.7%. (6) Nooksan† or pox is a condition in which small sunken spots appear on the rind, being caused by the collapse of certain cells between the oil glands. It is possibly due to the effect of hot dry winds on the developing immature fruits. The average for the groves was 2.4%. The wastage varied, being 5.2% in one grove and nil in another. (7) Fruit fly injury averaged 0.55%; all attacked fruits rotted.

91. SCHOONOVER, W. R., AND BROOKS, F. A. 634.3-2.111.3  
**The smokiness of oil-burning orchard heaters.**  
*Univ. Calif. Coll. Agr., Agr. Exp. Sta. bull.* 536, 1932, pp. 67, bibl. 25 in text.

The smoke nuisance caused by smudging in citrus orchards has now received serious attention. The authors note that the old theory that smoke was in itself of value as a frost preventive was adequately disproved by Kimball and Young‡ in 1920. The project reported here was restricted to an investigation of the smokiness of oil-burning heaters and did not include a study of the value of orchard heating or the efficiency of heaters. The methods of testing are described and graphs of the smoke test records and diagrammatic cross sections of numerous heaters and stacks are given. The tests showed that (1) the different heaters vary greatly in smokiness. (2) It is possible to burn ordinary grades of fuel oil in simple, cheap heaters without producing visible amounts of smoke at normal burning rates. (3) The smokiness can be reduced by proper regulation and cleaning. (4) The composition of fuel oils available commercially in California.—ED.] has no consistent influence on the smokiness of different heaters. (5) Laboratory tests run at summer temperatures are a reliable indication of the relative smokiness of heaters as operated in the field in winter. Heater manufacturers have studied heater design, availing themselves of the smoke measurement facilities afforded by the laboratory, and as a result have evolved such new stacks for use in old heaters, as will reduce smoke output at normal burning rates to invisibility.

The following is also noted :—

CLARK, S. W., AND FRIEND, W. H. California red scale (*Chrysomphalus aurantii*) and its control in the Lower Rio Grande Valley of Texas. *Texas Agr. Exp. Sta. bull.* 455, 1932, pp. 35.

\* See also H.A., 1932, 2:4370.

† "Nooksan" actually means missing flesh.—ED.

‡ Smudging as a protection from frost. *Monthly Weather Review*, 1920, 48:461.

92. NAMIKAWA, I., AND OTHERS. 634.451 : 581.46  
**On the flower types of *Diospyros Kaki*.**  
*Jap. J. Bot.*, 1932, 6 : 139-72, bibl. 29.

This is a technical account of the authors' investigations on the morphological nature of the pistillate and staminate flowers of the Japanese persimmon. Graphs, tables and macro- and microphotographs illustrate the text very thoroughly.

# TROPICAL CROPS.\*

93. LEAKE, H. M. 333.5  
**Studies in tropical land tenure.**  
*Trop. Agriculture*, 1932, 9 : 371-6, bibl. 9 and 1933, 10 : 13-17, bibl. 6.

Continuing this series the first reference deals with land tenure in Uganda, Nyasaland and Tanganyika. The second reference is concerned with the Gold Coast. The tenure systems in India, West Indies, Malaya, Ceylon and Kenya have already been described in vol. 9.

94. CHEVALIER, A. 634/5 (66.1)  
**Les productions végétales du Sahara et de ses confins Nord et Sud. (Plants of the Sahara and its northern and southern boundaries.)**  
*Rev. Bot. Appl.*, 1932, 12 : 669-919, bibl.

In two numbers (Sept. and Oct. bound as one) is given a very full account of the plant products of the Sahara and its borders, together with historical notes and the methods of culture in use. There are appendices on the experiment stations of the Sahara, on methods of preserving plant specimens and on biological research on desert flora, together with a short review of foreign work on desert flora. Among the fruit trees dealt with are the date and doum palms, the peach, almond, vine, fig, olive, carob, pomegranate, pear, apple, and citrus. There is a section on vegetables and condiments.

95. PARSONS, T. H. 634.4(54.8)  
**The cultivation of fruits in Ceylon with cultural details. VI. Some further fruits for the low country wet zone.**  
*Trop. Agriculturist*, 1932, 79 : 265-70.

Durian (*Durio Zibethinus*). An introduced tree of Malayan origin growing up to 100 feet in height. The large, somewhat oval fruits often exceed 6 lbs. in weight. The whitish, buttery flesh is enclosed in a hard spiny shell. The tree is not extensively grown and there is a ready demand for all available fruit. The trees vary considerably in productivity and in size and flavour of fruit, etc. so that careful selection is needed when planting. A moist tropical climate is essential and a good deep soil. Propagation is by seeds which should be sown immediately, their period of viability being very short. Since transplanting from nursery beds is difficult, the seeds should be sown singly in bamboo pots. Germination occurs in 10 days and planting out may be done 3 months later.

Custard Apple (*Annona squamosa*) is a small tree, commonly cultivated throughout the tropics. The fruit pulp is white, granular and sweet with a pleasant, slightly acid flavour. The tree thrives in both wet and dry zones in Ceylon from sea level up to 3,000 ft. and is remarkable for the unexact nature of its soil requirements, being equally at home in heavy soil (if well drained) or almost pure sand. The plant is usually raised from seed but seedling trees are very variable. Experiments have shown that superior trees can be produced by budding on the soursop (*Annona muricata*) using the inverted T method. Ill-health in custard apples can usually be traced to lack of drainage.

Soursop (*Annona muricata*). In cultural requirements the trees resemble the custard apple. The fruit, often 5 lbs. in weight, is used largely in the preparation of cooling drinks. Owing to

\* See also 6.

their size a crop of two dozen fruits is considered a reasonable yield. The tree does not always bear regularly, and it is suggested that in this and in other *Annonas* hand pollination would produce better crops. In Cuba a commercial fertilizer containing 3% nitrogen, 10% phosphoric acid, 10% potash has been found to aid fruit production considerably. The tree is usually raised from seed, but selected kinds should be budded on to its own seedlings, alligator apple or bullock's heart.

Ilama (*Annona diversifolia*). This variety, indigenous to the foothills of Mexico, Guatemala and Salvador is practically unknown in the Eastern tropics, there being only two plants in Perideniya, raised from seed received from the U.S. Dept. Agr. Washington, who first described and distributed the plant about 1912. It is reputed to be the finest annonaceous fruit that can be grown in the lowlands. Tests are now being made to find a suitable rootstock.

Rata Uguessa (*Flacourtia cataphracta*), Uguessa (*F. Ramontchi*) and Lovi-Lovi (*F. inermis*) are trees bearing small fruits useful for jams and jellies. Cultural notes are given.

[Previous articles of this series have been abstracted in *H.A.*, 1932, 2: 3: 290 and *H.A.*, 2: 4: 373 and 374. Useful notes particularly as regards possible rootstocks for tropical fruits can be found in J. J. Ochse's *Fruits and Fruitculture in the Dutch East Indies* 1931, English Edition.

—Ed.]

96. HOYER, F. 633.5-1.56  
Die Auswertungsmöglichkeit tropischer u. subtropischer Kultur- und Wildpflanzen für papiertechnische Zwecke. (**The possibility of economic exploitation of tropical and sub-tropical wild and cultivated plants for paper making.**)

*Tropenpflanzer*, 1932, 35: 499-513 and 1933, 36: 1-13.

The author notes that previous attempts to exploit the almost untapped paper resources of the tropics have generally failed owing to their uneconomical character involving very expensive machinery and large supplies of water. In this article he gives an account of a method for overcoming these difficulties, which has been tested on a large scale, at Köthen,\* Anhalt, Germany, for a number of otherwise more or less waste products. He discusses the process in general terms, noting the adjustments which are necessitated by different circumstances which may arise. The processes aim at a cheap method of converting the different raw material into easily transportable "half stuff." In the second part of his article he deals in turn with special phenomena observed and arrangements necessary in dealing with the following raw materials: Bamboos, bagasse, rice straw, maize straw, papyrus, cotton stems, reed (*Phragmites communis*), marsh plants in general, a palm species, *Bismarckia nobilis*, flax straw, and various grass varieties.

97. HACKEMANN. 631.83: 635.952.2  
Die Bedeutung der Kalidüngung in der neueren Literatur über tropische und subtropische Kulturpflanzen. (**The importance of potassic manuring in recent literature on tropical and sub-tropical crops.**)

*Ernährung der Pflanze*, 1932, 28: 348-9 and 366-9, bibl. 4.

The data given by the writer of this concise abstract are derived from the four following works: (1) *Monographien zur Landwirtschaft wärmer Länder*, a collection of monographs published by Auslands-Verlag Walter Bangert, Berlin; (2) *Tropische u. subtropische Wirtschaftspflanzen, ihre Geschichte*, by Von Bernegg, published by Enke, Stuttgart; (3) *Neues Handbuch der tropischen Agrikultur*, by Arnold and others, published by Tropenverlag Thaden, Hamburg; and (4) *The use of fertilizers in tropical and sub-tropical agriculture*, by Jacob and Coyle, published by Ernest Benn, London. The method adopted is to take the different types of crop in turn and quote abstracts from the experimental results or recommendations made by various authorities regarding the manuring of those crops. Among other crops the following are perhaps of particular interest to horticulturists: Sweet potato, cassava, soya bean, pea nut, sisal, jute, ramie, manila hemp, olive, rubber, tobacco, coconut, oil palm, pineapple, citrus fruits. Finally the manurial formulae given in Jacob & Coyle's book for the different crops are tabulated.

\* This information was given by the author in correspondence.—Ed.



98. AKHURST, C. G. 631.874 : 581.192

**The carbon and nitrogen contents of some natural covers.**

*J. Rubber Res. Inst. Malaya*, 1932, 2 : 131-9, bibl. 6.

The plants analysed were *Lycopodium cernuum* (stagmoss), *Gleichenia linearis* (bracken), *Paspalum conjugatum* (cattle grass), *Melastoma polyanthum* (Singapore rhododendron), *Nephrolepis biserrata* (fern), *Fagraea racemosa* (one of the "coffee family" plants), *Hevea brasiliensis* (rubber seedlings and tree leaves), *Centrosema pubescens* (leguminous cover crop), *Calopogonium mucunoides* (leguminous cover crop). Surface peat was also taken for purposes of comparison. The object was to find out what plants should be encouraged and what suppressed on rubber estates where natural cover for one reason or another is used. The results show that in the leaf materials of non-leguminous plants C/N ratios were very similar, being approximately 20 : 1, cattle grass and rubber showing exceptions. The C/N ratio for cattle grass was 14.8 : 1, while young rubber leaves were remarkable in exhibiting a nitrogen content of 4.23% which is nearly twice the amount found in other natural covers and almost equal to the figure for leguminous covers. The carbon content of the plant stems was fairly uniform at 45%. There was considerable variation in nitrogen content of plant stems and again the nitrogen content of the stems of rubber seedlings approached in value that of the stems of cultivated leguminous cover plants. The paper ends with a discussion of these results with a view to deciding the ultimate relative benefits to the soil produced by the growth of such covers.

99. NORRIS, R. V. 633.72-1.55

**Tea restriction.**

*Tea Quarterly*, 1932, 5 : 137-40.

Regulations for the restriction of the tea crop are expected in the near future. Methods for achieving restriction with economy and with regard to the welfare of the bush are discussed under the following heads. (a) *Plucking methods*. A finer standard of plucking, or normal plucking but with an increase in the length of the plucking round. The former method is preferable though more expensive. The extra cost, however, may be set off by the increase in price due to the improved quality of the tea. (b) *Resting of fields*. Gives an immediate and calculable degree of restriction, has elasticity of application and is of considerable benefit to weak fields. Resting before pruning leads to accumulation of important food reserves resulting in diminished loss from die-back when pruning is done. This aspect is of particular importance in Low and Mid-Country up to 3,000 feet. The period of resting should not be less than three months. Resting after a clean or rim-lung prune (not cut across or Travancore) encourages better wood formation and results in better leaf being more quickly obtained on the bush being taken back into plucking. The length of time for resting after pruning will depend on the growth made. For equal periods a greater restriction of crop will result from resting before pruning. (c) *Cessation or reduction of manuring*. Cessation means ultimate deterioration of the bush which may take long to recondition. Reduction of manure may be achieved by the substitution of inorganic artificials for expensive organics. If the crop is not to be injured through weakening, serious curtailment of manures should be compensated by resting the fields. (d) *Manufacture*. Leaf could be again picked over on arrival at the factory. This would improve quality and lead to a fairly large discard. An extra round of tipping leaf which only makes inferior tea could be discarded with benefit to the quality. Of the possible methods indicated the author prefers "resting" as being economical, easy of control and constructive in that it leads to ultimate improvement of the condition of the bushes.

100. EVANS, D. I. 633.72-1.56

**Tea manufacture in Ceylon.**

*Tea Res. Inst. Ceylon bull.* 9, 1932, pp. 70.

This bulletin discusses in detail the wide principles underlying the various processes of tea manufacture. It is recognized, however, that conditions vary so widely that it is not possible to lay down any specific routine of manufacture capable of universal adoption. A previous bulletin (No. 7) has already summarized the data relating to methods of tea manufacture used at the Research Institute at St. Coombs.

101. TUBBS, F. R. 633.72-1.531

**Note on tea seed size.**

*Tea Quarterly*, 1932, 5 : 113-4, bibl. 1.

From a study of the germination of tea seed already described (*ibidem*, pp. 66-68, *H.A.*, 1932, 2 : 3 : 282) it was found that extra large seed gave a higher percentage of successful germination and larger seedlings than did very small seed. The range of variation in seed size in a normal sample, however, is considered not to be sufficiently great to render further size selection necessary.

102. WELLENSIEK, S. J. 633.72-1.535

Het stekken van thee. (**Vegetative propagation of tea.**)

*De Bergcultures*, 1932, 6 : 778-81.

After allusion to a number of methods of vegetative propagation which had proved useless in the case of tea the article describes a method which has in the first experiments proved very successful. The method is the one known as the wire ring method which has been used with success on many difficult subjects but apparently not previously on tea. The method is essentially the same as that used for citrus by Oppenheim. (*Hadar*, 1932, 5 : 2-4, *H.A.*, 1932, 2 : 2 : 162.) It consists of cutting back young or even older plants almost to the ground. The young shoots which are then put forth from the stump are, when old enough, encircled near the base with the wire which is twisted round several times, closely but not tight enough to dent the skin of the back. The wired part is then earthed up and it is stated here that roots will appear in the soil above the wired portion in 5 weeks. If left for several months without disturbance 100% rooting can be expected. The best time for applying the wire is when the bases of the young shoots begin to turn reddish brown. It is postulated after Went Jr. that there is some substance in the leaves which, descending to the stem through the sieve tubes, causes root formation. This theory, it is claimed, is supported by the fact that shoots denuded of leaves failed to root until the leaves were allowed to grow, and that the rooting of shoots with one and two additional girdles of wire applied above ground was reduced from 100% to 30% and 9% respectively. [Full translation available.]

103. COOPER, H. R. 633.72-1.542

**Pruning experiments.**

*Indian Tea Assoc. Q.J.*, 1932, part 3, pp. 120-49.

An account of pruning experiments undertaken by the Tocklai Experimental Station, which, it is claimed, have been successful in indicating methods of increasing the crop from March to June, while methods tested with the object of reducing losses in the rains are thought to have practical value. Attempts to get a cold weather crop and to increase the autumn crop were not successful. The temperature of the cultivated soil at the surface has a much bigger amplitude than that of the uncultivated, i.e. it gets warmer during the day and colder during the night, but this amplitude is quickly "damped down" with depth where the surface is cultivated. The mean temperature for the summer months down to a depth of 60 cm. was about 2°C. cooler in the cultivated than in the undisturbed soil.

104. PRILLWITZ, P. M. 633.72 : 581.144.2

Wortelonderzoek bij de theecultuur. (**Root investigation in tea cultivation.**)

*De Bergcultures*, 1932, 6 : 1352-6.

This article is not so much concerned with tea roots as with the root systems of the cover crops grown with the tea. It is stated that whereas tea normally has a tap root descending to a depth of 3 metres, this is very often modified by the existence of hard pan or other impervious subsoil layer through which the tea roots cannot penetrate. The choice of a cover crop therefore becomes important and must be guided by soil conditions, if root competition is to be avoided. The low growing cover crops *Vigna Hosei*, *Centrosema pubescens* and *C. Plumieri* have a deep root system with very few roots in the upper layer. *Calopogonium mucunoides* is more shallow rooted. *Indigofera endecaphylla* has a strong lateral surface root system and is therefore liable to rob

the tea plant of soil moisture in times of drought. Bush cover crops *Tephrosia candida* and *Mimosa invisa* are good plants for penetrating hard subsoils, the former being the deeper rooted. *Tephrosia Vogelii*, *Crotalaria anagyroides* and *C. usaramoensis* are largely surface rooting tree cover crops. *Derris microphylla* has the widest surface root spread and *Leucaena glauca* the deepest penetration. *Albizia falcata* and *Erythrina subumbrans* are intermediate between these two. If a quick growing ground cover crop is used, it is a good plan to cut it back at the beginning of the dry weather and spread the debris on the ground around the tea bushes. The relative advantages of tree cover crops and ground cover crops are discussed. Choice will depend on local conditions, but generally speaking shade trees are the more useful in plantations at low altitudes where their shade is of more importance than the moisture absorption of their roots. Cutting round the tea bushes at a suitable distance with a spade is a method of reducing root competition, it enables treated plants to get a good start when conditions are favourable for growth, and also adds considerably to the effect of manuring. [Full translation available.]

105. ANON. 633.73  
 La culture du café à l'ombre. (**Cultivation of coffee under shade.**)  
*L'Agronomie Coloniale*, 1932, 21 : 154-5, reprinted from *Revista do Instituto do café do Estado de Sao-Paulo*, April-May, 1932.

Tests with recording thermometers in coffee plantations in Sao-Paulo, Brazil, showed little difference between the mean annual temperature in the sun (70.016°F.) and in the shade (69.386°F.), but the temperature under the shade was not subject to such violent fluctuations as in the open. In this instance the shade was provided by eucalyptus trees, and it is stated that the presence of these trees seemed to impart an extraordinary vigour to the coffee bushes. This is ascribed to the fact that while the deep rooting eucalypts do not interfere with the surface rooting coffee, their leaf fall provides a continual supply of rich humus which both feeds the coffee and conserves the soil moisture. A table showing the analysis and manurial value of this debris is given. Coffee grown in the shade was considered to have increased in size of berry and to have improved in flavour.

106. BAGALSO, C. C. 633.73-1.541.44  
**Top working old coffee trees which are poor yielders.**  
*Philippine Agriculturist*, 1932, 21 : 491-504, bibl. 8.

In this experiment 137 low yielding *Coffea robusta* trees were cut back to from 60-90 cm. above the ground. Of the shoots which subsequently grew from these stumps (in 18-49 days) 3 or 4 were allowed to remain and were cleft grafted when fit (in about 250 days). The scions used were taken only from main stems and were (a) young and green, or (b) older with woody stems. The covering material used was either glass tube (30.8% success), sphagnum moss (8.4% success) or banana leaf petiole (4.8% success), the two last being moistened or changed respectively when necessary. Grafts with no covering beyond grafting tape gave 21.8% success. The old woody scions gave 37.8% success, the young green scions 14.1%. The size of stock or of scion did not appear to have any direct relation to the success of the grafting.

107. BOULNOIS, DR. 633.88  
 Traitement indigène de la lèpre par l'écorce d'un Cynométra en usage chez les Guérés de la région Toulépleu (Côte d'Ivoire). (**Treatment of leprosy by the bark of *Cynometra* among the Guérés of the Ivory Coast.**)  
*Rev. Bot. Appl.*, 1932, 12 : 451-3.

The writer discusses the remarkable freedom from leprosy, only 13 cases, some cured, out of a population of 40,000, in the Guéré tribe of the Ivory Coast. The tribe take the strictest quarantine measures against any sufferer, but attribute their immunity and many cures to treatment with the bark of a leguminous tree, *Cynometra Vogelii*. The powdered bark is applied to the sores, sniffed up the nostrils, and, mixed with water, is taken internally. So far it is stated no analysis has been made of the constituents of this tree. Instances of reputed cures are given.



108. D'ANGREMOND, A. 633.912-1.541.41  
 Stump-enten op wortels van oude Hevea boomen. (**Stump grafting on roots of old Hevea trees.**) [In English and Dutch.]  
*Archief v.d. Rubbercultuur in Ned. Ind.*, 1932, 16 : 349-63, bibl. 6.

The problem of replacing old rubber trees without temporarily lowering the yield of the plantation is a difficult one. Interplanting is not a success, as the young trees suffer from malnutrition due to the shade cast by the older trees preventing the proper functioning of the leaves, and to their root competition preventing the full assimilation of the necessary nutrients. Experiments are described whereby it is hoped to enable a young stump to gain additional nutriment by causing it to live semi-parasitically at the expense of the old tree, which latter will in years to come be removed, leaving the other in its place. The method is to bore a hole with brace and bit through a thick surface root of the old tree, as far from the trunk as possible, and insert in the hole the young rubber stump in such a manner that its root passes through the hole and emerges the other side. The upper joint is then waxed, but the under part is left unsealed to allow the wound secretions to drain off. The root is then covered again with soil. Thick stumps have been found to be better than thin ones. Perfect unions in all cases examined were obtained. The experiments were begun in March, 1931, so that it is still too early to draw any conclusions as to the benefit the young stumps may derive from this association. However, figures published do show a slight but definite increase in circumference of the stump graft over the controls a year after their first insertion, and it must be noted that union does not even begin till 5 months after the graft is made. Budding on roots of old trees was also tried, but the difficulty was to induce the buds to start and no bud graft has been a permanent success. Three photographs show details of the method including a section of a united stump graft.

109. HAINES, W. B. 633.912-1.874  
**On the effect of covers and cultivation methods on the growth of young rubber.**  
 III.  
*J. Rubber Res. Inst. of Malaya*, 1932, 4 : 123-30.

Measurements are recorded for the growth of young Hevea trees at the Rubber Research Institute Experiment Station under various covers, namely *Calopogonium*, *Crotalaria*, *Leucaena*, under clean weeded conditions, and on ground with timber left lying. Most covers have shown some retarding effect, which has been least in the case of *Leucaena*, while *Calopogonium* and *Crotalaria* produced a retardation of about 14%. An important result is that trees in belukar have only shown  $\frac{1}{3}$  increase of girth compared with the clean weeded plots and are also inferior to those under covers. Slashing every 6 months very slightly improved the growth. This block is considered to have entered on a stage of delayed growth after an initial period of good growth. The uncontrolled half is to be left for further observation, but selective weeding will now be practised on the slashed part with a view to obtaining evidence of the kind of undergrowth to be permitted. It is remarked that trees which have lagged in growth at least a year behind their associates are often able to catch up and even surpass the others quite irrespective of any fertilizer treatment. It is as if an accumulation of potential energy during the retarded period had been suddenly released.

110. ANON. 634.441  
**Bombay mango extension.**  
*J. Jamaica Agr. Soc.*, 1932, 36 : 548-9.

The paper is concerned with plans for increasing the production of the Bombay mango (of Jamaica). This fruit is the best shipping mango that Jamaica possesses, having a firm skin combined with a good flavour and absence of fibre. Unfortunately it does not fruit equally well in all parts of the island, failure to do so being attributed to climatic conditions. It is considered essential that there should be dry weather from January to March, the flowering period. Directions are given for raising rootstocks from seed of the common mango. Owing to the plant's resentment of disturbance it is recommended that seeds or very young seedlings

should be put in their permanent positions and budded 9-18 months later. To secure a large supply of bud wood it is proposed that older trees of common types should be employed, the method being to cut back all branches above their first fork (not down to a few feet of the ground as in citrus) leaving one small branch uncut to assist the tree. The subsequent numerous shoots should be thinned out evenly round each branch. They can be then T budded when half an inch or less in diameter or patch budded when  $\frac{3}{4}$  in. in diameter with buds of the Bombay mango. After 6 or 8 months growth of the budded shoots the branch left to maintain the tree can be cut out. By this method parent trees for future budwood supply can be formed within two years. The remainder of the paper is taken up with an outline of a scheme for obtaining a Government grant to further the extension of a mango industry, and proposals for its allocation if obtained.

111. BORJA, V., AND BAUTISTA, B. 634.441 : 581.145.1 : 632.111.3

**Mango investigations in Muntinlupa, Rizal.**

*Philippine J. Agr.*, 1932, 3 : 111-43, bibl. 2.

The investigations were undertaken on 27-year-old seedling trees of two local mango varieties, Carabao and Pico, growing together in two plantations, one in the plain and one on the hillside. Part of the studies is concerned with comparisons between the two varieties and is of mainly local interest. The experiment of smudging to force premature flowering and fruiting should, however, be noted. Smudging can be defined as the production of a suffocating smoke by means of a slow burning bonfire. The smudges were built at an average distance of 8 metres to windward of each tree, 3 smudges to every 4 trees, 95 trees being treated. Flower buds emerged in 84% of the cases in from 7-9 days, pollination taking place while the flowers were fragrant, two weeks after first emergence of the bud. The fruits matured in less than 5 months from emergence of the bud. Trees not producing flowers within 14 days of continuous smudging will not as a rule do so at all that season, particularly if the twigs and leaves are less than a year old. Smudging was discontinued when the flower buds had emerged and had grown to 5 cm. Since trees as far as 60 m. away were forced into bloom by smudging, and since in certain districts where the wind is unsuitable smudges are built on platforms actually in the branches of tall mango trees, it is considered that the premature flowering is not induced by the increased heat of the ground. The best yields were obtained from trees smudged in December and January. November smudging was not successful owing it is thought to the prevalence of pests and disease. Statistical methods were employed and the tables showing the figures are given.

112. GONZALEZ, L. G. 634.441 : 581.145.1 : 632.111.3

**Influence of smudging on the respiration and catalase activity of the mango**  
(*Mangifera indica* Linn.).

*Philippine Agriculturist*, 1933, 21 : 533-40, bibl. 4.

The experiments were carried out at the College of Agriculture, Los Baños, on old trees of the Pico variety in Jan.-Mar., 1923, and in Feb., 1932. The smudges were made of green and dried grass, etc., and were kept burning day and night. The branches used in the experiment were covered with test tubes or with paraffined paper bags; in the former case the leaves were removed leaving part of the petiole. The technique used in determining the respiration and catalase activity is described. All the trees smudged in this experiment flowered. The control trees did not. Branches covered with test tubes or bags flowered when the tree was smudged, but more of the exposed branches flowered. The possibility that the stimulus exerted on the uncovered smudged branches was transmitted to the covered ones is somewhat discounted by the known proclivity of the mango to localized stimulation of vegetative growth or flowering. Following smudging there was a significant increase in rate of respiration of the leaves and twigs of the mango trees. There was a slight but consistent increase in the catalase activity of the leaves, terminal buds and bark, and a very significant increase of activity in the wood. It is suggested that heat and not CO<sub>2</sub> or other product of combustion is the primary factor in early flowering after smudging.

113. SMITH, A. C. 634.61  
**San Blas coconuts in Malaya.**  
*Malayan Agr. J.*, 1932, 20 : 583-5.

In order to compare the San Blas coconut, regarded as a prolific variety in Central America, with the ordinary tall variety of Malaya under Malayan conditions, 200 seed nuts were obtained in 1920/21 from Panama of which 80% germinated, and 150 were planted out in alternate rows with the tall variety in three types of soil under exactly similar conditions. The soil types were : low lying peaty soil, drained every fourth row—an outcrop "sand" ridge of almost pure white shell, the outcrop lying 3-4 feet above normal soil level and being thus well drained—a belt of very heavy yellow clay with a water table of 3-3½ ft. Under these conditions it was found that in the number of nuts harvested per palm and in its copra content the San Blas coconut was much inferior to the Malayan tall variety. A feature of the San Blas was the heavy premature nut fall. This is ascribed to physiological causes brought about by the environmental conditions which are very different from the sandy sea-shore of their habitat.

114. CELINO, M. S. 634.61-2.78-2.96  
**Fungous disease of the coconut leaf miner.**  
*Philippine Agriculturist*, 1932, 21 : 481-90, bibl. 9.

A study of the entomogenous fungus *Beauveria bassiana* (Bals) Vieill which has been found attacking the coconut leaf miner *Promecotheca cumingii* Baly. This is said to be the first recorded instance of its attacking *P. cumingii* in the Philippines.

115. HARCOURT BUTLER TECHN. INST., PRINCIPAL. 634.651-1.556.8  
**Production of papain from the fruit of the papaya tree (*Carica Papaya*).**  
*Agriculture and Livestock in India*, 1932, 2 : 471-89.

The article discusses the establishment of plantations of papaya chiefly with a view to the extraction of papain on a commercial basis. The fruit after tapping may be marketed, though prices are lower than for untouched fruit. Balance sheets showing costs of production of an actual profit earning papaya plantation are given covering a period of 4 years from the starting of the plantation. The plantation should not contain trees more than 4 years old. Of the fruits tested the most productive of papain was the Bombay variety. The juice is extracted from the fruit by lancing with a sharp knife of horn, ebony or stainless steel. Iron or ordinary steel will spoil the colour of the product after drying. The cuts, four in number and evenly distributed, are made in a straight line along the fruit from the stem to the apex, the exuding juice being collected in enamel or earthenware dishes held beneath the fruit. The drying which should be done at once, when on a moderate scale can be efficiently carried out in an apparatus (illustrated) consisting essentially of a metal sheet surmounted by a glass drying plate on which the juice is spread in the sun, with a glass cover and adequate ventilation. After drying the papain is reduced to powder by grinding with an ordinary porcelain pestle and mortar and sieving. If produced on a large scale, the method employed for drying milk might be used, namely spraying the juice into warm air and collecting the dust. Directions are given for testing the purity of the product.

116. CONDIT, I. J. 634.653  
**Check list of avocado varieties.**  
*California Avocado Assoc. Year Book for 1932*, pp. 1-21.

The check list now contains about 400 varieties of avocado and many descriptions. It is announced that in order to save space descriptions of obsolete or less important varieties have been omitted but that such information on any particular variety may be had from the secretary on request.



117. STOUT, A. B. 634.653 : 581.162.3  
**Sex in avocados and pollination.**

*California Avocado Association Year Book for 1932*, pp. 172-3.

Avocados fall into two groups in respect of flower behaviour, (A) those which open for a first or female flower opening in the forenoon, closing at midday till the afternoon of the following day, when they open for a male flower opening, and (B) those which open for the first or female opening in the afternoon and for the second or male opening on the following forenoon or in cool weather on the forenoon of the second day. In each case the behaviour is uniform throughout the entire tree. Thus to ensure proper cross pollination it is essential that there should be an interplanting of "reciprocating" varieties and much of the poor bearing of avocado can be attributed to this not having been done. It is considered advisable that bees, which are fond of avocado nectar, should be kept to provide a sufficiency of insect pollen carriers. Studies in avocado pollination are now being organized by the department of botany, Miami University, Florida.

118. CALKINS, G. R. 634.653-1.541.44  
**Top grafting the avocado tree.**

*California Avocado Association Year Book for 1932*, pp. 93-4.

The stump should be cut back to within three feet of the ground. If the trunk is much scarred or twisted, it may be preferable to graft on the original rootstock, even though this may mean some excavation. After grafting, to prevent sunburn, the stump should be covered in paper and the scions enveloped in a tough perforated paper bag. The holes in the bag should be enlarged as the scions elongate and they should finally be allowed to grow through openings cut in the bag which is not removed till the scions are large enough to provide shade. Unwanted scions should be allowed to grow at first along with any suckers which may arise from the stump, as this maintains a circulation of the sap and assists healing. Later they can be gradually eliminated by a systematic pinching back. If cared for on these lines strong scions will be developed which will not require staking except in exceptionally windy positions.

119. PARKER, E. R., AND HORNE, W. T. 634.653-2.8  
**The transmission of avocado sun-blotch.**

*California Avocado Assoc. Year Book for 1932*, pp. 50-56.

Experiments are described which are considered to indicate that sun-blotch is a virus disease.

120. QUAYLE, H. J. 634.653-2.7  
**The trend of avocado pests and their control.**

*California Avocado Assoc. Year Book for 1932*, pp. 38-9.

The following pests are discussed with suggestions for appropriate treatment: *Aspidiotus lataniae*=Latania scale, fumigation with calcium cyanide. *Paratetranychus yothersii*=avocado brown mite, new on the avocado in California, dusting with finely divided sulphur. *Heliothrips haemorrhoidalis*, the commonest avocado thrips, two sprayings at intervals of 2 to 3 weeks of 1 pint nicotine and 1 to 2 lbs. casein spreader to 100 galls. water. Larvae of moths *Sabulodes caberate* and *Amorbia essigana* and the May beetles *Serica* sp. and Fullers rose beetle. For these and other leaf eating insects a dusting of barium fluosilicate and cryolite combined with talc or diatomaceous earth, or, if brown mite is also present, with 75 per cent sulphur, is recommended.

121. CHEESMAN, E. E. 634.771/3 : 575.252  
**Mutant types of the dwarf banana.**

*Trop. Agriculture*, 1933, 10 : 4-5, bibl. 3.

The dwarf banana (*Musa Cavendishii*) (Cavendish, Canary or Chinese) is an invaluable commercial variety, thriving where taller varieties will not. Although widely distributed, it is not known

whether it is everywhere the same or whether it has given rise to sub-types or local races. In this paper (taking it provisionally to be a single type) the evidence is discussed for the assumption that occasionally in its agricultural history the dwarf banana has thrown bud sports, some at once recognizable, others so different as to pass for new varieties. The evidence produced is (1) A reference in Fawcett's "The banana" to a sport of the Canary banana occasionally found in Teneriffe plantations and distinguished by being double or treble the usual height. (2) Two obvious mutants of the dwarf type in a collection at the Imperial College of Tropical Agriculture received via Kew from the Botanic Gardens, Teneriffe, in 1927, and a third very distinct type received at the same time from the same source. This latter differs from the usual Cavendish type in being rather taller, but especially in shedding all its male flowers with their subtending bracts soon after they have opened, leaving the rachis bare, a feature common to the majority of banana varieties other than the dwarf. Prolonged observation of its characters however, and the fact that, like all dwarf bananas, it fails to set seed in any pollination experiments make it reasonably sure that it is a vegetative sport of the dwarf. (3) Two sports procured by Mr. H. C. Sampson, Economic Botanist, Kew, from Teneriffe in 1931, which resemble the dwarf in all points except stature. (4) A banana called Giant Chinese collected in Guadeloupe in 1927 by Dr. S. C. Harland and handed over to the Imp. Coll. Trop. Agr. (5) An article on the banana in Martinique by Mr. D. Kervégant, Chef de Service d'Agriculture, in *L'Agronomie Coloniale*, 1931, 20 : 161-7, describing two local forms, Grande naine and Petite naine. A photograph in that article shows a Grande naine apparently arising as a bud sport from the stool of a Petite naine, but evidence of underground connection is unfortunately not available. M. Kervégant in correspondence asserts that sub-types exist in both Grande and Petite naine. (6) An article by Dr. C. J. J. van Hall in *De Indische Mercur*, 1932, vol. 55, p. 245, stating that the variety Congo of Surinam is a sport of a dwarf variety. Although it has a naked rachis, a possible objection against naked rachis bananas deriving from the dwarf persistent bract type is removed by (7) the finding of a variety in Trinidad, obviously belonging to the Congo group, which produces some stools showing persistent bracts, others showing clear rachis and all intermediate types, the extremes sometimes occurring on different bunches on the same stool.

122. MARTINEZ, J. R. 634.771/3 : 581.192  
**Comparative mineral contents of Philippine bananas : calcium, iron, magnesium and phosphorus.**  
*Philippine Agriculturist*, 1933, 21 : 547-50.  
 Analyses of 20 local varieties are given.

The following also are noted :—

- DASTUR, R. H., AND DESAI, B. L. **The relation between water content, chlorophyll content, and the rate of photosynthesis in some tropical plants at different temperatures.** *Ann. Bot.*, 1933, 47 : 69-88, bibl. 24.  
 ELAYDA, A. **Pineapple culture in the Philippines.** *Philippine J. Agr.*, 1931, 2 : 281-303, bibl. 5.  
 MOLEGOODE, W. **Turmeric, its cultivation and preparation in the Kandy District.** *Trop. Agriculturist*, 1932, 79 : 271-3.  
 SAVELLI, R. **Studien über den Ferrarischen Hanf. (Genetical studies of hemp in the district round Ferrara, Italy.)** *Züchter*, 1932, 4 : 286-90.  
 BRAUN, R. **Betrachtungen über Kaffeekulturen auf Savannenböden in Nordangola. (Notes on coffee growing on savannah soils in North Angola.)** *Tropenpflanzer*, 1932, 35 : 433-9.  
 JULIANO, J. B., AND CUEVAS, N. L. **Floral morphology of the mango (*Mangifera indica* Linn.) with special reference to the Pico variety from the Philippines.** *Philippine Agriculturist*, 1932, 21 : 449-67, bibl. 16.  
 BUNTING, R. H. ***Actinomyces* in cacao beans.** *Ann. Appl. Biol.*, 1932, 19 : 515-7, bibl. 2.

## STORAGE.

123. MILLER, E. V., AND BROOKS, C. 664.84/85  
**Effect of carbon dioxide content of storage atmosphere on carbohydrate transformation in certain fruits and vegetables.**

*J. Agr. Res.*, 1932, 45 : 449-59, bibl. 13.

Peaches, cherries, sweet corn and garden peas were subjected to various concentrations of CO<sub>2</sub> at different temperatures and for different periods of time and were then analysed. The temperatures used were 0, 5, 10, 15, 20 and 25°C., treatment at the higher temperatures being usually for 1-3 days and at the lower for 2-6 days. No significant difference in percentage of reducing sugar, total sugar or acid-hydrolysable polysaccharides was observed when sour and sweet cherries and Belle peaches were treated with 35 to 47% CO<sub>2</sub> concentrations, though similar concentrations retarded the rate of sugar loss in peas and sweet corn. The same concentration at 15° and 20°C. produced a characteristic overripe flavour in peaches but did not so affect cherries. Exposure to 43% to 47% CO<sub>2</sub> for two days did not affect the flavour of Gradus and Nott Excelsior peas at 25° and 15°C. At 5° the flavour remained normal for 3 days. Increasing the time of exposure was usually detrimental to flavour.

124. RASMUSSEN, L. 664.85.037  
 Studien über den Reifungsprozess und die Haltbarkeit des schwedischen Obstes bei der Aufbewahrung im Kühlhause.\* (**The ripening process and keeping quality of Swedish fruit in cold store.**)  
*Angewandte Botanik*, 1932, 14 : 460-506.

This is a continuation of the author's previous article in the same journal, vol. 13, pp. 473-525.\* Here the author gives details of the life in cold store of apples of the 1928 harvest, representing some 35 varieties, and of pears, 19 varieties being represented. The lots consisted of about 12 apples or 15 pears of each variety. The fruits were in each case taken from 1 tree the age of which varied in the apples from 8-50 years and in the pears from 4 to 88 years. Notes are given of the geology and the actual soil in which the trees were growing and the exact length of time which the fruits stood up to ordinary and cool storage before rotting or breakdown occurred. Corresponding with the observations made suggestions are offered as to the best times for putting the different fruits on the market. Especially noticeable in the case of pears is the additional life afforded by cool storage. [Although the experiment by reason of the small units employed and the fact that each lot comes from 1 particular tree of one particular age on a particular soil would appear to preclude the drawing of general conclusions, universally applicable, the article gives useful indications for the different varieties concerned.—ED.]

125. BARRETT, W. E. 634.85.23.037  
**Cool storage of cherries.**  
*Agr. Gaz. New South Wales*, 1932, 43 : 860, reprinted in *Fruit World of Australasia*, 1932, 33 : 671.

The information here given comes from a cool store proprietor at Orange (Australia), who is here stated to have had very successful results with the storage of cherries and other soft fruits. Cherries should be ripe but not soft ripe, and should be cool stored as soon after picking as possible. The best temperature for storage is between 30-32°F. and not above 33°F. Lining papers round top, side and bottom should be used, but end papers are unnecessary. Cherries for storage are best packed in half cases filled only high enough to allow the lids to be tied on without pressing. The pressure in completely filled, nailed down boxes is a cause of mouldy fruit. Deterioration in store is first indicated by the drying of the stalk and its separation from the fruit. Early Lyons, Florence and St. Margaret cool store well. Bigarreau Napoleon is liable to "brown" where touched as it does when fresh picked. The length during which cherries can be held successfully in store is from 4-6 weeks.

\* See *H.A.*, 1932, 2:1:90.



126. TILLER, L. W. 664.85.11 : 632.1  
**A superficial spotting disease of the Lord Wolseley apple.**  
*New Zealand J. of Sci. and Technology*, 1932, 14 : 111-3, being *Cawthron Inst. Cold Storage Publication No. 9*.

The disease begins as a minute yellowish-brown spot, rapidly darkening to buckthorn-brown or ochraceous tawny, Dresden brown or cinnamon brown (Ridgway's Color Standards 1912). The spots, usually situated at the lenticels, enlarge and coalesce, forming irregular blotched areas. The skin only and not the underlying flesh is affected. Experiments are considered to have established that (1) the spotting is a photo-chemical and not a temperature effect, in fact the maintenance of a storage temperature of 32°F. rendered the apples much less susceptible to spotting on subsequent exposure to light than if stored at 38°F. and must be regarded as one of the most effective control measures at present available; (2) late picked Lord Wolseley are much more susceptible than early picked; (3) as with Jonathan spot which, however, develops in the absence of light, wrapping in oiled paper gives only a small measure of control or about 7%. It differs in this respect from superficial scald which is almost entirely eliminated by the use of oiled paper; (4) the stalk end of the apple is generally more severely affected than the calyx end; (5) other varieties on which a similar spotting has been produced under the action of light are Cleopatra, Granny Smith, London Pippin, Cox's Orange Pippin.

127. HOCKEY, J. F. 664.85.11 : 632.1  
**Gravenstein spot scald.**  
*Scientific Agr.*, 1932, 13 : 225-7, bibl. 2.

An account of an injury resembling scald which appeared on apparently normal Gravenstein apples the day after exposure in a shop window in Canada in late autumn. The injury consisted of spots, often coalesced into irregular depressed areas, 15-20 mm. in diameter. The epidermis and 4-8 layers of hypodermal tissue were collapsed and brown. Sound tissue lay adjacent to the majority of spots but occasional areas were found with progressive rot developing. The "spot" scald appears only on mature fruit containing no starch in the pulp cells and practically no sucrose. The symptoms did not develop unless the fruit was exposed to light. Comparing these factors with those influencing apple scald it appears that this injury has other causes than volatile esters. It is suggested that a photo-chemical reaction is in part responsible. Sulphur dioxide injury was a possible explanation, but no positive reaction for sulphur could be obtained on the skin. A pronounced response to the sodium nitro-prusside reaction test for glutathione was obtained, indicating that this or some other compound containing sulphur may be a contributory cause.

128. MARLOTH, R. H. 634/5-1.547.6 : 547.313.2  
**Ethylene colouring and ripening of fruits and vegetables.**  
*Farming in South Africa*, 1933, 8 : 17-18, 21, bibl. 5.

The principles involved in the process are outlined and references are given to publications containing complete instructions for those wishing to instal ethylene plants. These are *Coloring citrus fruit*, California Fruit Growers Exchange, 1932, which, Dr. Marloth states, though a complete guide, with working plans, is based on the assumption that electricity is available, and an article by J. R. Winston in the *United States Dept. Agr. Yearbook*, 1932, p. 134, entitled "Citrus fruit coloring," in which is worked out the "trickle system" of gas application, whereby the air circulating through the colouring rooms can be made to contain automatically the desired concentration of gas combined with maintenance of the right temperature and humidity. Ethylene has no effect on eating qualities of citrus. R. B. Harvey, *Minnesota Agr. Exp. Sta. bull.* 247, 1928, is quoted in support of the statement that green tomatoes coloured by ethylene are sweeter than those picked green and allowed to ripen. In the Transvaal tasting squads have been unable to differentiate between papaws normally and ethylene-ripened. Mangoes which have a turpentine flavour when not fully ripe do not appear to lose it under ethylene, hence fully grown fruit only should be coloured. Bananas can be coloured evenly throughout the bunch. It is suggested that the method might be of use in large cities where green bunches in

store could be coloured as required. Harvey is again quoted as coming to the conclusion that dates, jujubes, pears, custard apples, endive, chicory and rhubarb can also be successfully coloured and ripened but that water melons, cauliflowers, asparagus, fruits or vegetables containing little carbohydrate reserves or with a thick impenetrable rind cannot.

### PROCESSING.\*

129. BUXTON, B. H., AND DARBYSHIRE, F. V. 634.1/8 : 581.192  
**Note on the hydrogen ion concentration in fruit extracts.** (Being contributions from the Wisley Laboratory, LXVI.)  
*J. Roy. Hort. Soc.*, 1933, 58 : 139-43, bibl. 2.

The authors note that nearly all their tests were made twice. The fruits or other specimens were mashed and filtered through asbestos in a water-pump vacuum. The filtrates were then tested in an apparatus with quinhydrone electrodes and a colour test was also made by the B.D.H. capillator method. The extracts give the mean of the whole sap. Details are given of the pH value of unripe and ripe specimens of most of the common English fruits as also of certain citrus fruits, and of sundry agricultural roots, etc. The unripe fruits were found to be very little, if at all, more acid than the ripe fruits. The data given here are compared with data cited by Small in his work entitled "Hydrogen ion concentration in plant cells and tissues," Vol. 11, Berlin, 1929.

130. THOMAS, J. E. 634.21-1.56  
**The sulphuring of apricots.**  
*J. Council Sci. Ind. Res.* (Australia), 1932, 5 : 228-35.

1. Under field conditions, the amount of SO<sub>2</sub> (sulphur dioxide) absorbed in drying apricots is closely related to the time of exposure to the fumes in the sulphuring chamber and to a minor degree to the amount of sulphur burnt. 2. The method of drying after sulphuring has an important influence on the SO<sub>2</sub> content in the resultant product; shade drying leads to a loss while sun drying appears to preserve the SO<sub>2</sub> content of the dried sample. 3. Heavy spraying or allowing to stand overnight before sulphuring appears to have little significant influence on the SO<sub>2</sub> content. 4. An estimate of the probable amount of SO<sub>2</sub> absorbed may be obtained in the field by applying an iodine test to the freshly sulphured fruit. 5. Under storage conditions a heavy loss in SO<sub>2</sub> occurs; there is reason to believe that the losses in moist, packed fruit are heavier. 6. The re-processing of apricots is discussed. The rate of SO<sub>2</sub> absorption on re-sulphuring is shown to be correlated with the moisture content. Evidence is advanced in support of the contention that, in order to retain a satisfactory colour, re-processed fruit should contain not less than 10 grs. of SO<sub>2</sub> when packed. [Author's summary.]

### NOTES ON REPORTS AND BOOKS.

131. HORTICULTURAL EDUCATION ASSOCIATION. 634/5(058)  
**The H.E.A. Year Book for 1932**, Vol. 1. R. T. Pearl, Editor, S.E. Agr. Coll., Wye, Kent, pp. 92, 3s. 6d. post free.

The H.E.A. has not been slow to realize that the imposition of tariffs on horticultural produce entering this country has offered to horticulturists a golden opportunity which must be seized and turned to good account forthwith.

The editor modestly describes the purpose of this new publication as the provision of "a means of interchange of news and views between the different educational elements that comprise our membership."

\* See also 115.



For the enlightenment, however, of those to whom the Association is not well known, we might here point out that the members who express their views in this first number are not only members of an association, which has hitherto been somewhat prone to hide its light under a bushel, but are also in several cases leading workers in the particular branch of horticultural research which they here discuss.

The articles, as it appears to us, can be divided into three classes. In the first place we have two articles, one on the planting situation, the other on landscape gardening, in which the rôle and functions of the county horticultural officer are discussed in relation to these two problems. In the second we get interesting accounts of routine, though specialized, horticultural practice in Cornwall, Hertfordshire (glasshouse), Jersey (new potatoes), and Brittany (cauliflower). In our third division we should put the particularly valuable papers which give short accounts of research progress in the following subjects: Vegetable breeding at Cambridge, vegetable diseases in the Bristol area, glasshouse problems, spray application, and the effect of orchard factors on storage qualities. Linking divisions two and three is an article on a most successful county demonstration plot at Cannington, Somerset.

The publication is well printed and we shall look forward to its future appearances with great interest.

132. EVANS, I. B. POLE.

634/635(68)

**Arable farming and pasture problems.**

*Farming in South Africa*, 1932, 7: 341-52.

This number is devoted to the Annual Report of the Department of Agriculture. Dr. Pole Evans in the section on arable farming deals with the following subjects of particular interest to fruit-growers: Entomology (including fruit insects), Horticulture, Viticulture, Low Temperature Research, Inspection of Fruit. It must be noted, however, that only actual statements of research projects in progress are made, no details being given of particular experiments. HORTICULTURE. The following investigations are being conducted: At *Bathurst Experiment Station* on pineapple selection, paper mulching with pineapples and small fruits, development by selection of single crown Smooth Cayenne pineapples, citrus variety tests. At *Nelspruit* on citrus-rootstock selection and trials, rootstock identification by chemical means, fertilizer trials, ringing, topworking, papaw selection, ethylening of various fruits, tomato selection and breeding. At *Klipdrift Experimental Plot* in the Long Kloof on rootstocks for deciduous fruits. There are other experiments also in the Long Kloof on berry fruits and hazelnuts. In *Western Cape Province* on chlorosis in deciduous fruit trees. In *Northern Transvaal* on the establishment of olive and citrus varieties, and at places not stated on citrus fertilizers, cover cropping and irrigation trials and their effect on transport and wastage. VITICULTURE. Research includes trials of pruning sultanias, and of grape varieties, including dessert grapes and aims also at the production of an export wine of high sugar but less high alcohol content. LOW TEMPERATURE RESEARCH. Storage problems of grapes and apples (especially bitter pit), and the utilization of cull fruit are all receiving attention. INSPECTION OF FRUIT. Statistics of exports are given.

133. ANAGNOSTOPOULOS, P. TH.

634.63(38)

**Olive Growing in Greece.** [Greek-English table of contents 6 pp.]

Lampropoulos, Athens, 1931, pp. 304, price 225 drachmae.

This work is a comprehensive manual on olive growing written especially for Greek conditions but capable of much wider application. It is profusely illustrated, the diagrams being perhaps more valuable than the photographs which suffer from the type of paper used. The author shows that Greece is third only to Spain and Italy in production of olive oil, while olive products, i.e. oil and eating olives make up nearly a fifth of the total agricultural production of the country. The different types of olives grown in Greece are classified into 3 classes, namely, the small fruited class, with fruits weighing less than 2 grammes, of which 12 varieties are described, the medium fruited class, fruits 2-3 grammes, represented by 15 varieties, and the large fruited class, fruits 3.5 grammes and upwards with 10 varieties. Methods of propagation are by seed, cuttings



(hard and soft wood), layers, suckers and separation of root pieces. Much the commonest method so far has been that by seed. The author discusses every aspect of production including irrigation and harvesting, while about one-third of the book is devoted to the pests and diseases of the olive in Greece and their control.

## 134. TRINIDAD.

633.74

***Report of the Department of Agriculture, Trinidad and Tobago, for the year 1931***, pp. 61.

This report contains a progress report made by the Agronomist (p. 29) of the following experiments conducted on cacao by the Dept. of Agriculture at River Estate, Trinidad. (a) Shade reduction; (b) Distance spacing; (c) Propagation; (d) Seedlings from heavy bearing tree No. 4927; (e) Colour of pods; (f) Manurial. Experiments with cacao on the Marper Estate are concentrated on the effect of various treatments on witchbroom incidence and crop production, and are classified as (a) Cultivation experiments (drainage and shade); (b) Manurial and lime experiments; (c) Spray experiments; (d) Miscellaneous observations on witchbroom. The mycologist, pp. 54-7, presents an illuminating article on witchbroom disease of cacao.

## 135. INTERNATIONAL INSTITUTE OF AGRICULTURE.

635.952.2(072)

Stations expérimentales et autres institutions officielles, ou privées s'occupant du développement et de l'amélioration de l'agriculture dans les pays chauds.

**(Agricultural research stations and institutes in the tropics and sub-tropics.)**

Int. Inst. Agriculture, Rome, 1931, pp. 166, price lira it. 20.

A short account is given of practically every Research and Experiment Station in the tropics and sub-tropics throughout the world. The information includes a note on the matters in which a station is particularly interested, its area and often the amount of its annual expenditure. Detailed information is confined to crops. Experimental farms and similar institutions concerned with stock are dealt with in detail, only if their activities include the study of forage crops. Should a Department of Agriculture control several Stations as, for instance, in Tanganyika, a separate account is given of each. A most useful compilation.

## 136. V.D. PLASSCHE, A. W.

634.1/8(73)

De fruitteelt in Amerika. (***Fruit growing in America.***)

C. Misset, N.V., Doetinchem, 1932, pp. 341, illus.

A study of the fruit growing industry of the United States of America. The author, government horticultural adviser for Zeeland, visited America in 1931 to collect data for this work. The first four chapters describe the early history of America, conditions for travel, the growth and importance of the industry in America and give a general survey of the conditions under which the industry is run. Following this a chapter is devoted to each of the main cultural operations such as tillage or cover cropping, manuring, disease prevention, and pruning. There is a separate chapter on each of the principal kinds of fruit, apples, pears, cherries, plums, grapes, etc., the subject matter here being mainly a description of the most popular varieties with notes on the climate and soil conditions to which they are best suited. The final chapters are devoted to picking, packing and marketing. On the question of apple rootstocks the author notes the disinclination of the American grower to use anything except seedling crab, grown from seed which he imports from France or Austria. The Americans, he says, though prepared to admit the advantages of the vegetatively raised standardized rootstock are not yet convinced that the extra trouble and expense involved in raising the stocks vegetatively will be sufficiently compensated by increased returns. Other reasons given by them, according to the author, are that they need in their dry soil a deep rooting taprooted tree, that in any case their soil conditions are not suitable for vegetative propagation on a large scale, and that, although they use seedlings, they can control the growth and fruitfulness by irrigation. Nevertheless, being aware of the advantages of uniformity growers have considered the use as stocks of seedlings of certain varieties such as Ben Davis, Rome Beauty, Northern Spy, etc., which are considered to produce a uniform type from seed. Seeds from local sources, too, would have a better germination and

be much less liable to mixing than seeds imported from abroad. Rootstocks are being tested in many experiment stations, the chief aim there being to secure a cold-resistant stock, "winter killing" being one of the principal sources of damage in American orchards. Pear stocks are usually wild French pear seedlings, but it is suggested that Winter Nelis and Bartlett might give good results as sources of uniform seedlings for stock work. Research on pear stocks is mainly directed to discovering varieties immune to fireblight. Rootstocks used for other fruits are briefly mentioned. Turning to the subject of manuring the author says that on this question there is as much difference of opinion in America as in Holland. In general, however, manures are needed in much smaller quantities in America owing to the land being carefully chosen before planting and being usually virgin soil, whereas in Holland the prospective grower plants on land already in his possession usually for the reason that it is poor in quality and unsatisfactory with quicker growing crops. In America, he says, the idea that nitrogen affects adversely the disease resistance, fruitfulness and quality of the fruits is unknown, and any effect on the keeping quality is offset by the excellence of the cold storage arrangements, under which the apples even from the most heavily nitrogened ground will keep till August. In the actual technique of growing the author does not seem to think that much can be learnt from America, the climatic and soil conditions being so totally different, but he points out with emphasis that in grading, packing, marketing, in co-operative selling and in fact in his conduct of the whole commercial side of the business the American is far ahead of the European. The advice offered to Dutch growers as a result of his journey can be reduced to the two words—*specialize* and *co-operate*. If this is done efficiently all the rest must follow. A warning is given, however, against heavy production without due regard to the possibilities of consumption; quality rather than quantity should be the aim. Among the things not to copy from America, says the author in conclusion, is their "make money" fetish, since such an obsession is bad for the soul. He adds, however, that there will have to be a considerable improvement in Dutch fruit growing for any such risk to imperil the souls of his countrymen.

137. IMPERIAL BUREAU OF FRUIT PRODUCTION. 634.3-1.53/54

**Investigations on the standardization of citrus trees by propagation methods.**

*I.B.F.P., tech. comm. 3, 1932, pp. 43, bibl. 101, 2s.*

Contents are as follows: Variation in citrus orchards—Polyembryony—Vegetative propagation—The scion—Rootstocks, (1) those in common use, and (2) other *Rutaceae* worth investigation.